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THE CHEMIST;

OR,

REPORTER OF CHEMICAL DISCOVERIES AND IMPROVEMENTS,

AND

PROTECTOR OF THE RIGHTS OF THE CHEMIST AND CHEMICAL MANUFCTURER.

EDITED BY

CHARLES WATT, ESQ.

LECTURER ON CHEMISTRY,

AND

JOHN WATT, JUN.

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INTRODUCTION.

We have now completed the first volume of The Chemist, and terminated our labors for the year. We shall take a brief survey of the progress which the work has made, and of the advancement of the several branches of science, of which it is the record.

That it has shared the usual fate of all works of the kind—that it has roused the envy of rival journals—and that it has been the subject of futile attempts to injure it, and retard its acquirement of public estimation—is no more than might be expected. The Chemist, however, has had more than these to struggle with and to defeat: worthlessness, knavery, pitiable ignorance, and deception in parties who should have assisted us in our undertaking, but who took upon themselves that which they have left us to perform; together with the feeble efforts of contemporary malignity. Such means as have been adopted for the purpose of crushing our work, had they come from ordinary sources, would have excited no wonder; but when it is stated that the engine of our attempted destruction was a *Magazine of Philosophy*—it may cause some surprise.

In the first of these cases, we had an easy alternative, that of adding, to the labor and responsibility of editing, the whole expences of the journal from the commencement to the present time, which we cheerfully undertook, from the firmest conviction of the ultimate success of our labors; and with every hope of rendering it, from time to time, still more deserving of public favor.

In the latter case, added to our most ineffable contempt, so far from succumbing, as doubtless it was hoped we should have done, to the unworthy stratagems of our opponents, we were only the more resolved to exert all our endeavours to render every number of the work still more perfect.

Our triumph has been most complete; and The Chemist has now arrived at a sale, far exceeding our most sanguine anticipations; and we have received, we hope not undeservedly, the most unqualified approbation of men of science, and the more enlightened journals, which is far from being the ordinary lot of works of this nature; and it has established itself—"*Per varios casus, per tot discrimina rerum.*"

The want of a journal expressly devoted to Chemistry, Chemical Manufactures and Pharmacy, has long been felt; there is not one which can be considered as at all adapted for the chemical reader. There are, it is true, some few miscellaneous works, containing articles in various sciences and arts, and one or two others, composed of dull and heavy subjects of abstruse calculation, written expressly for those journals, and which seem as if they were intended to gratify the inclination of their authors for displaying their profundity, and to limit the number of their readers. These works form no record of chemical science, which should consist of all that occurs within the period of publication. It was to supply this deficiency that The Chemist has been established, and every pains has been taken to keep it in the closest conformity with its object.

In each number of our work, since its first appearance, will be found detailed descriptions of every thing worthy of note, in Chemistry, Chemical Manufactures and Pharmacy, which has taken place in this country, and

on the continent; so far, at least, as the limits of our space would admit. —In the earlier numbers we have given full, and very minute details concerning the brilliant discovery of DAGUERRE; and the more recent improvements in the manipulation of the process, and its application to practical purposes in the arts. We have also given many excellent methods of preparing the photogenic papers.

To mention all the articles most worthy of notice, would occupy a space far exceeding that which we have allotted to these introductory remarks: we may, however, notice some of them. We wish that we could boast more English and fewer foreign names among the authors whose luminous articles adorn the pages of this volume, and we hope that next year, when our increase of size will much augment the labor of editing, our scientific readers will more freely contribute papers in the various branches of science embraced by THE CHEMIST.

In the department of CHEMISTRY, we have given, in addition to articles from our own pen, and selections from the English scientific journals, faithful translations of such of the memoirs read before the continental academies of sciences as our space would admit of, together with many very valuable articles from various foreign scientific periodicals. Among these we may name, as of high interest:—"On the means of distinguishing Vegetable Alkalies by Chlorine, and by the Sulphocyanide of Potassium," by M. Lepage: "Researches on the Chemical Action which the Metallic Salts exert on Liquid Albumen and on Certain Tissues of the Animal Economy," by M. Lassaigne: M. Berzelius on Tartaric Acid; Knapp on the Formation of Emetic; "On the phenomena of Calefaction," by M. Boutigny. M. Kuhlmann has also furnished to the chemical reader some very interesting papers, namely, those concerning the properties of finely divided and spongy platinum, and his—"Contributions to the history of alcohol, pyroxylic spirit, and ethers." M. Becquerel, long known to our readers as a chemist of great eminence, has also this year contributed much to science, in his investigations concerning electricity: he figures, also, among the inventors of photogenic papers. M. Laurent, likewise, is among those whose names most frequently occur in the present volume; his researches in organic chemistry have been attended with curious and very interesting results. M. Deschamp's paper on rennet is of a very important nature, and well worthy of an attentive perusal. Berzelius's paper on the composition of bile, is also one of the most important items in the summary of the transactions of the year. The names of Pelouze, Dumas, Rose, and Girardin, Hess, Vogel, Fritzche, Persoz, Penny, Johnson, Johnston, Troost, Gmelin, Thomson (Professor T.), Azaïs, Planche, Soubeiran, Capitaine (the two latter very frequently in connection), Erdmann, Malaguti, Melsens, Deville, Arago, Daguerre, Schönbein, Schafhæutl, Mohr, Couërbe, Liebig, and many others, too numerous to mention, have this year made their appearance in THE CHEMIST. Next year, we hope to be able to give a long list of English contributors.

In the department of CHEMICAL MANUFACTURES, we have also to express our obligation to our continental brethren for their many signal improvements in the various branches of industry, and chemistry applied to the arts. Chevreul's investigations concerning dyeing are of great interest, and of much practical value. M. Bontemps has also added to our information concerning the manufacture of flint and crown glass. In this division we have given numerous photographic, photogenic, and electrotype discoveries, processes and improvements; modes of detecting various

adulterations; Professor Delarive's process for gilding metals by electro-chemical action, without the use of mercury. A Memoir, by M. Boucherie, on the preservation of wood, is well worthy of the attention of all classes of readers, as detailing some interesting and highly useful facts. Various processes for manufacturing lighting gas, and, among others, those of M. Selligue, have been given. We are indebted to MM. Girardin, Preisser, Osmin Hervy and Colin, for well directed investigations concerning the coloring matter of the *Polygonum Tinctorium*, and for various excellent practical methods of extracting it; to MM. H. Reinsch, Girardin and Preisser, for useful and very valuable information concerning the refined cashoo of commerce, and its adulteration; to M. Becquerel for a paper entitled—"General Considerations on the Application of the Physico-Chemical Sciences to the Natural Sciences, to the Arts, and Manufactures;" to Mr. Pellatt, for a concise and detailed description of the manufacture of flint glass; and to Mr. Dircks, for an article on gamboge. We may also mention, as of high interest, a paper on Bleaching Powder, by Mr. Muspratt, and one on the Formation of Acetic Acid, by Mr. Jullion. Many others there are, also highly deserving of notice, if our limits would permit us to enumerate them.

In the department of Pharmacy the list of articles is so long that we can mention but very few. Dr. St. Ange's Memoir on *Monesia*, or, as it is now more properly called, *Buranhem*, gives an account of the wonderful properties of that medicine, and of the miraculous cures effected by means of it and its various preparations. Among these we may mention cases of leucorrhœa, menorrhagia, diarrhœa, hœmoptysis, scurvy, chronic bronchitis, scrofula, syphilitic affections, &c., &c.; in these cases the extract was administered internally: the monesia ointment also was completely successful in the removal of ulcers. As with all other new and much vaunted medicines, monesia was tried after every other remedial measure had failed.

The efficacy of the hydrated peroxide of iron as an antidote for arsenic has been fully and satisfactorily proved, and we have from time to time given instances in which its success has been undoubted. We earnestly recommend chemists and druggists always to keep this useful antidote in their shops. Dr. Spaetr has found the hydrated peroxide of iron efficacious as an antidote for Scheele's green (arseniate of copper).

The various ferruginous preparations have this year risen still higher in estimation: we have given numerous new formulæ for them in our journal. Lactate of iron, administered in the form of lozenges, has been found very advantageous in chlorosis, &c. We are also indebted to M. Louradour for a process for making this useful medicine, and for means of detecting the adulterations to which it is liable.

Vaccination, although strictly speaking more a medical than a pharmaceutical subject, has been treated of. M. Sedillot has endeavoured to prove that revaccination is quite unnecessary.

We have given many cases of poisoning by various toxical substances, together with the antidotal measures successfully adopted in those cases. The statistics of poisoning show a frightful amount of persons who had died in the years 1837 and 1838 from poison, accidentally taken, wilfully administered, and taken by many for the purpose of flying the troubles of this world, and swallowed during intoxication, lunacy, passion, and despair. Communications from very sensible correspondents on the sale of poisons, have at various times made their appearance in this work.

Something surely might be done to diminish this melancholy sacrifice of human life.

Many formulæ for new medicines, and new methods of preparing old ones, have found a place in our columns: these are so numerous that we can only thus generally allude to them.

M. Orfila's investigations concerning the presence and natural existence of arsenic in the human bones, as detailed in his Memoirs on this subject, have the highest claim on our attention. His high standing as a toxicologist, and as a chemist, give a deservedly great weight to his opinions. We have also laid before our readers his Memoirs on poisoning by antimonial and cupreous preparations, which, doubtless, have been read with infinite delight by men of science. M. Orfila has demonstrated the natural existence of copper in man, a fact, which Signor Cattanei, in an article of which we have inserted a translation, has endeavoured to disprove, his experiments having led to a negative result. It has been proved that copper naturally exists in many natural products.

Marsh's apparatus for detecting minute portions of arsenic has been found of very great utility in medico-legal investigations. In the case of Madame Laffarge, who, a short time ago, was tried for poisoning her husband, it enabled M. Orfila to detect arsenic in the body of the poisoned man, although several chemists, who used it for the same purpose, obtained only a negative result,—a circumstance for which M. Orfila very satisfactorily accounted.

We thank those who have contributed towards filling the columns of THE CHEMIST. Among our most useful and sensible correspondents, we may rank Mr. MACKAY, of Edinburgh, whose communications we always feel great pleasure in receiving.

In conclusion, we cannot but feel the highest gratification at the very flattering reception of the work, and its rapid and continued advance in public estimation; and these are our best rewards for the unceasing efforts we have made to render it deserving of the support it has received. In the change we find it necessary to make, a still more enlarged opportunity of increasing its claims on the public approbation will be afforded us. The sphere of its usefulness will be greatly extended, as, by augmenting its size, we shall be enabled to introduce the higher subjects of chemistry—to give insertion to many very valuable foreign Memoirs which we have been constrained to lay aside for the present—to supply much original matter, and to give a far greater variety of topics—so that, in fact, no scientific journal of the day, at more than double the price, will yield an equal quantity or variety of information of the highest order. No expense shall be spared—nor means neglected to render THE CHEMIST more and more useful from number to number. From every source which the labors of our own country, France, Germany, &c., will afford, will be selected the most important additions to our knowledge of those sciences which form the subjects of THE CHEMIST.

To the above we shall, from time to time, add such original articles on chemistry and its application to the arts, as long experience—unremitting study and research—and the most extended opportunities of observation and investigation, have afforded us in all chemical subjects. Our vigilance will ever be on the alert to impart knowledge, and our labors will ever be exerted to execute our arduous, but pleasing engagement with the public, to the fullest extent of our ability, hoping to derive the satisfaction of knowing that our exertions have not been made in vain.

THE CHEMIST.

ADVERTISEMENT.

That the objects which this Journal embraces, viz. those of reporting, from time to time, the various discoveries and improvements in Chemistry, Chemical Manufactures and Pharmacy, and those of protecting the rights of the Chemist, the Chemical Manufacturer and the Druggist, as well as the interests of the Public, from the schemes of ignorance and imposture, are of the most vital importance to every class of society, will be admitted by all who are competent to judge of such subjects.

It is proposed, therefore, to arrange the Papers which the work contains, under the three distinct heads of—Chemistry,—Chemical Manufactures,—and Pharmacy; and, under each head, to give a full and satisfactory account of all discoveries and improvements made during each month.

The endeavour to protect the interests of the Chemist will naturally blend itself with the articles, whether original papers or abstracts, in which they are involved. The time, assuredly, is one at which this is urgently called for, both in relation to manufactures and to medicine.

We may take, for example, the case of the scientific chemist, who in the course of his labours has been successful in the improvement of some art or process founded in chemistry. What are at present his hopes of remuneration? They are dependent either on the protection which can be obtained by patent, or on the chance of the process being kept secret from workmen and competitors.

If he obtain a patent, he is left to the "forlorn hope" of discovering any infringement; and even if assured of its existence, he is without the prospect of obtaining evidence to prove it, so as to gain legal redress. In recourse to law, he has little chance of any result but the loss of his money.

In an attempt to carry out his improvement without patent, how is he situated? Can he expect to keep the process from the eyes of the men employed, and consequently from being generally known, when a few shillings would purchase all that they know? Every one who understands these matters, is well aware of the reply which must be given.

In order, therefore, better to protect these parties, we seek to arouse them to an earnest attention to their own interests, by making some determined efforts to obtain from the legislature amendments in the patent laws. This, we are convinced, would best be accomplished by the establishment of a board of scientific men, whose duty it should be, to judge of all patents before they are granted, and by adopting the rule that, when once passed, they should be held secure throughout the whole of their term,

and not be rendered void by any subsequent act. This would have the effect of keeping out of the office all worthless patents, and of securing protection to those that are valuable.

In connection with this, we must here take notice of persons trafficking in chemical processes, a class by no means small, who either under delusion themselves, or hoping to delude others, attempt to foist upon manufacturers and others, processes of various kinds, frequently too ridiculous to deserve any grave consideration, yet often with a success so enormous as to astonish any reflecting mind. We could enumerate some recent instances of this kind, which exceed all that is known in quackery; and, like the latter, they seem to succeed in the exact ratio of their worthlessness, so far as the extortion of money from the ignorant is concerned.

In order to protect the manufacturer and capitalist, as well as the abler chemists and inventors, our Journal will contain a brief review of chemical patents specified within the month, so as to lay before the public the real merits they may possess.

We may now allude to the interests of the retail chemist, the compounder and dispenser of the products of pharmacy; and we deplore that, notwithstanding many brilliant and honourable exceptions, in too many instances his state of knowledge is defective. Too often he can do little more than combine products purchased, at the cheapest possible rate, of some wholesale druggist, without being at all able to determine the goodness or badness of any one thing he is called upon to dispense. Here, therefore, the health of patients may be sacrificed to ignorance of the quality of the drug, or incapacity to detect by experience the correct combination of the chemical to be employed.

The retail chemist ought, therefore, to be compelled to undergo a strict examination as to his knowledge of the nature of drugs and their medical properties, so as to enable him to detect any error in prescription, and insure his committing no mistake through ignorance. It will then be seen that, even in this department, the patient is in the hands of a man of scientific attainments, who can at once detect the unchemical nature of any prescription, and who will be amenable for the due performance and exercise of his calling.

The retail chemist, however, is out of his province, in attempting either to discriminate the diagnostic signs of disease, or to prescribe for them. Strange to tell, such is the absurd anomaly of our institutions, that though the chemist's knowledge of the healing art is supposed to be good at home, yet the moment he puts his foot out of doors, and dares to administer in the most trifling case, that instant he subjects himself to the degradation of lengthened imprisonment and heavy fine.

We must next notice the interference of the apothecary with the chemist. There is not, perhaps, a single class of tradesmen who are so ill-regulated, or we should rather say, who are so entirely without regulation, as apothecaries. Out of every fifty now practising as surgeons and apothecaries, not more perhaps than one-fifth have passed the College of Surgeons. They mostly keep open shops, as they are generally of humble origin and scanty means, in order to benefit by that which ought to be left to the chemist entirely, and thus they have every opportunity to practise surgery as well as medicine, there being no legal check, and no one being empowered to detect them. Thus do they act in total defiance of all law relating to the government of medical practice, to the injury of the better educated part of the profession, and to the imminent danger of public health.

The Apothecaries' Act, which is to expire

this year, will leave, if due provisions be not made, still greater licence than now exists. It is greatly to be hoped, therefore, that some act will be brought in to secure the public from the gross ignorance, quackery and extortion of these men, who are now allowed to drench their credulous patients, and empty their purses. Such disgraceful practice requires an immediate remedy.

This remedy is to be effected both by an act assigning to apothecaries a particular rank in the profession, and by making it imperative on them to obtain a respectable classical and scientific education, which would infuse into them some portion of liberality. The mode of remuneration for the apothecary should be by a regulated scale of fees for attendance; and he should be allowed neither to send in medicine, nor to sell by retail.

While, then, we advocate restrictive laws against the chemist, we advocate them against the medical practitioner, giving to each his peculiar province. The present system of cramming patients with medicine in order solely to pay the medical man for his time and attention, calls aloud for the interference of parliament. Separate the province of the chemist from that of the practitioner, and the remedy is at hand. The practitioner has no longer for remuneration to look to the number of the draughts he supplies; but, as his advice and time are his stock in trade, and as his knowledge has been acquired by the investment of capital, he should be paid the interest thereof by the only legitimate mode, viz. charges for the continued supply of his professional skill and experience, without being subjected to the degrading alternative of remunerating himself at the expense of the health and comfort of his patients.

It is a lamentable fact also, that grocers, tallow-chandlers, tailors, and, in short, any person, are allowed to deal openly in articles denominated drugs. This fact is followed by one still worse: the articles generally supplied to these persons are of the most impure or damaged kind, and are sold at a corresponding rate. It not unfrequently happens, for instance, that carbonate of soda (sesquicarbonate) sold by such persons, is principally plaster of Paris (sulphate of lime), a very cheap insoluble substance, always liable to lodge in the bowels, and thereby produce inflammation; and such articles as senna, rhubarb, and the like, have generally been damaged by salt water or otherwise. They are sold cheap, and the public seem satisfied. A number, however, of sudden and premature deaths probably result from suffering unqualified persons to vend such articles.

We recommend to the more enlightened Members of Parliament to bring in the long-proposed Medical Bill, and to engraft thereon the opinions we have now expressed; and when we say *we*, we speak for thousands of our professional brethren. Let there be placed on the Statute-book a law by which the practitioner may receive, otherwise than at present, the price of *his* advice and attendance; the chemist, that of *his* knowledge and experience in the preparation of all medicinal compounds; assigning also to each his peculiar province, and preventing the sale of all chemicals and drugs except by those regularly trained to the profession, whose knowledge shall be tested by the strictest examination.

At the time when any Act of the Legislature is passed for the regulation of medical practice, it will be the duty of Parliament to appoint a Board of Inspectors of Medicine, whose province it ought to be to visit, examine and report, the qualities of the drugs and chemicals of medical men and chemists, condemning such as are bad, and fining those chemists who employ them. These officers ought also to be em-

powered to take cognizance of all abuses throughout the profession, and particularly as regards the exercising of such portions of it as the parties are not qualified to practice.

We have carefully perused the Specifications of all Patents occurring within the month, and have found none of sufficient importance to demand any remark, as we felt no great reliance on the practicability or efficiency of the various processes they detail.

We regret that the list of the prices of Drugs, with their tretts, tares and duties, is, by the misconduct of the party employed to collect such information, too late for the present Number: such omission shall not occur again.

I. CHEMISTRY.

ON THE DIRECT COMBINATION OF OXYGEN WITH ATMOSPHERIC AIR, FORMING THE BINOXIDE OF AZOTE, OR NITROUS GAS, BY THE TRANSMISSION OF THESE GASES THROUGH A PORCELAIN TUBE HEATED TO BRIGHT REDNESS.

BY CHARLES WATT.

It has long been well known to chemists, as long indeed as the discovery of the composition of nitric acid by Cavendish; that oxygen and azote do not unite when, in their gaseous state, and under the ordinary circumstances of temperature, &c., they are exposed to mutual contact in the proportions in which they are found to exist when separated by analysis from each other, viz. (n + 2 O) i. e. azote 1·14; oxygen 2·16; and that therefore, the binoxide of azote cannot be formed except by the action of nitric acid upon some of the more oxidable metals.

The only means formerly known of causing their combination were those employed by Cavendish in the year 1785, and published in the Philosophical Transactions, which were the mixture of these gases in a glass vessel, in the proportions of 3 volumes azote and 7 volumes oxygen, and the passing of electric shocks repeatedly through them. The Rev. J. Milner subsequently found that, when ammonia is passed over black oxide of manganese raised to a red heat in a porcelain tube, the ammonia is decomposed, and water, nitrous acid and nitrate of ammonia are formed.

No other means of forming a direct combination of these gases have as yet been established, and it is evident that their affinity under ordinary circumstances is very slight.

Conceiving that these gases may be made to combine, and thus serve many practical purposes of importance in the arts, I employed the following process and apparatus. I filled two bladders, one with atmospheric air, and another with oxygen, each of them having attached a long and slender glass tube fixed into one end of a porcelain tube, which passed through a furnace in which was maintained a heat just sufficient to preserve the tube of a uniform redness. To the same end of the tube was attached another little apparatus for generating steam if required, as I conceived might be the case in the course of the experiment, if nitric acid were likely to be produced, that being known to be always combined with water or hydrogen. I next made gentle pressure upon each of the bladders for a few seconds, so as to cause some of the atmospheric air and oxygen to pass off into the tube; and the results were evidences of nitrous oxide both as to odour, and the redness of its fumes, by the contact of the atmosphere or of oxygen, while passing out of the end of the tube left free (namely, the opposite extremity to that having the apparatus fixed to it), and likewise the acid properties it gave to water into which it was transmitted. As often as the pressure on the bladders was resumed, so often did these evidences return; and they were much increased by the admission at the same time into the tube of small quantities of steam or of pure hydrogen.

I have often repeated these experiments, and always with like results. I shall repeat them with many additions, and give the results in future Numbers of this Journal.

I may here add, that I have long been of opinion that nitric acid is a triple compound of oxygen, azote and hydrogen, and that it does not exist in water in a state of combination or solution, which is commonly asserted in books, as well as that nitrous acid is the point of oxidation of azote (azote 1, oxygen 4), at which the combination of these gases stops, unless hydrogen be added; and that addition enables the azote to unite further, i. e. with five proportions of oxygen (azote 1, oxygen 5) which are known to exist in nitric acid.

MEMORANDUM ON THE INTENSITY OF REFLECTED LIGHT AND HEAT.

BY PROF. FORBES.*

At the meeting of the Society on the 4th of February, I remarked, on the occasion of Professor Kelland's paper on the intensity of reflected light, that it was almost without a parallel in science, that a quantitative physical law like that of the intensity of the reflection of light at different angles, should have first been divined by the rare sagacity of Fresnel, and confirmed by the very different but elaborate mathematical investigations which Mr. Green of Cambridge and Professor Kelland have applied to the subject, whilst scarcely any attempt has been made towards its verification by direct experiment.

Some critical cases for polarized light were indeed assumed as the basis of the original formula; and M. Arago has confirmed it by one or two intermediate photometrical experiments; but the chief evidence for the truth of this remarkable law rests on the indirect observation of the change of the plane of polarization of an incident ray after reflection.

It occurred to me, about the end of 1837, that the anomalies of photometrical observations being nearly as unsatisfactory as ever, some light might be thrown upon this important subject by ascertaining the law in the case of heat, the intensity of which we have no difficulty in measuring. And since the discovery in the case of heat, of refraction, single and double, of polarization, of total reflection, and the change it produces on polarized light, as well as the change of the plane of polarization by simple reflection, there seems the greatest reason to suppose that the laws of reflection for heat and light, if not identical for both, would be connected by some simple analogy.

Accordingly, during the month of December 1837, I made some preliminary observations, which encouraged me to proceed. It appears to me, from those observations, that the quantity of heat reflected from different transparent bodies is independent, or nearly so, of the nature of the source of heat, and the diathermancy of the reflecting body, and that at 55° of incidence the intensity of reflected heat is nearly that which Fresnel's theory gives. The substances, however, were not all prepared so as wholly to exclude the action of second surfaces.

I have this winter resumed the subject. I have had an apparatus constructed for securing sufficient accuracy in determining the angle of incidence, and I have used reflecting surfaces, both transparent and metallic: the former are wedges of plate-glass, by means of which reflection from the first surface only may be observed, and the latter are plane specula of steel and silver. The prosecution, however, of these apparently simple experiments has been attended with unforeseen difficulties; and although the relative proportions of heat at different angles of incidence are now pretty well determined for glass in several cases, I am not prepared to say whether the absolute amount is exactly the same as Fresnel's formula would give, assigning to heat its proper refractive index. It is satisfactory, however, to know, that the approximation to it is much greater than direct photometrical measures have yet given, with the single exception of two experiments of M. Arago already referred to; and that I have reason to believe that the experimental law which Mr. Potter has given from direct observation in the case of light, represents my results much less accurately than the theory of Fresnel.

With respect to reflection at the metals, I believe I may assert that I have verified the remark of Mr. Potter, that metallic reflection is *less* intense at the higher angles of incidence. I have attempted to ascertain whether it reaches a minimum, and then increases up to 90° of incidence, as Mr. Maccullagh supposes, but I have not obtained decisive results. The quantity of heat reflected by the metals is so much greater than Mr. Potter's estimate for light, as to lead me to suspect that his photometric ratios are all too small, which would nearly account for their deviation from Fresnel's law.

The most complete verification of Fresnel's law would be found in observations made on heat polarized in opposite planes. These I have attempted, and, so far as they go, they seem to confirm the analogies of heat and light. But the intensity is so much reduced in the process of polarizing, that I fear we must wait for yet more delicate instruments to measure it. In the mean time I may state the method which I propose to employ.

When heat is polarized by transmission through inclined mica plates, the polarization is *incomplete;* but if the plates be inclined at the polarizing angle, the transmitted heat is undoubtedly composed of a portion p polarized (in a plane which we will call +), and a portion $1 - p$ unpolarized. This latter part philosophers are content to consider as compounded of a part $\frac{1-p}{2}$ polarized +, and an equal part polarized —. Now, let the intensity of reflected heat polarized in the plane of reflection (or —), and that perpendicular to it

* From the *Proceedings of the Royal Society of Edinburgh*, March 18, 1839.

(or +), be represented by the following table, which contains the quantities to be *found*.

TABLE I.

Incidence.	Reflected Rays Polarized. +	—
0°	a_0	b_0
10	a_1	b_1
20	a_2	b_2
&c.	&c.	&c.

Also let the quantities of heat actually *observed* to be reflected after *incomplete* polarization by passing through a mica bundle, be the following:

TABLE II.

Incidence.	Polarizing Plane of Mica bundle. +	—
0°	A_0	B_0
10	A_1	B_1
20	A_2	B_2
&c.	&c.	&c.

Now, the quantities A and B will be thus composed: the quantity of heat transmitted by the mica bundle and incident on the reflecting surface contains, when the plane of polarization is perpendicular to the plane of reflection, a portion of heat $p + \frac{1-p}{2}$ polarized +, and a portion of heat $\frac{1-p}{2}$ polarized —; let these quantities be m and n; then $m + n = 1$. Now, let the plane of polarization be turned round 90°; then the part polarized in the plane of reflection will now be m, and that perpendicular n. So that the heat is first composed of a part m reflected according to the law of a in Table I., and a part n reflected according to the law of b; and then the converse; so that

$$A_q = m\,a_q + n\,b_q$$
$$B_q = n\,a_q + m\,b_q$$

Hence $A_q + B_q = a_q + b_q$, as it evidently ought, and

$$A_q - B_q = (m-n)(a_q - b_q)$$

Hence *the differences of the columns in Table II. are in a constant ratio to the differences of the columns in Table I.*; and as Table I. may be computed from Fresnel's formulæ

$$\frac{\tan^2(i-i')}{\tan^2(i+i')}, \text{ and } \frac{\sin^2(i-i')}{\sin^2(i+i')}$$

the agreement or discrepancy will be apparent, and the coefficient $(m-n)$ will indicate the polarizing power of the plates. Also, since the sum of the numbers will be the same for both tables, a single comparison would suffice to determine the index of refraction, which must be assumed in computing the first table.

NEW AND EASY METHOD OF GENERATING CHLORINE GAS.

BY CHARLES WATT.

It may not be generally known to our readers, that chlorine gas may be generated in a very easy manner, and in a pure state, by means of chloride of sodium (salt), nitric acid, and some metallic oxides.

The process and the quantities of each substance which I employ, are as follows.—Some chloride of sodium is put into as much water as will dissolve it. A sixth part of nitric acid, and as much black oxide of manganese or peroxide of lead (minium), is next added. A gentle heat is then applied to the vessel, when the gas passes over in great abundance, and is very pure.

The chief advantage of this method is, that there is no sudden and violent action, nor any chance of breaking the vessel, which is the case when sulphuric acid is used.

LENZ'S REMARKS ON CERTAIN POINTS IN THE DOCTRINE OF GALVANISM.*

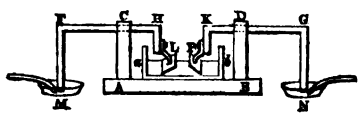
IT may be recorded as one of those profoundly incomprehensible facts, which in physics continually occur, that a class of phenomena, such as those of galvanism, should, during a period of forty years, have been subjected to the observation of the most subtle experimentalists, among whose names are to be found the most distinguished; and that, with respect to the particular source of such phenomena, we are even now as much in the dark as at first. Indeed after Volta, abnegated, by means of his celebrated pile, the existence of the cause of these phenomena in animated organization, and presumed them to arise from directly opposite sources, the opinions of the speculative, upon the particular seat of the so called electro-motive power of the galvanic circuit, became divided; and the earlier doctrine ascribed this power to the contact of heterogeneous conductors; while the other sought it in the chemical action of the fluids upon the solids which are in contact with them. At the present moment, the latter chemical theory of galvanism is supported by distinguished advocates; as, for instance, Faraday, De la Rive, Becquerel, &c., although again each of these, in the detail of his views, differs from the others. If, however, my own patient investigations and numerous and varied experiments have led me to embrace Volta's earlier theory, the weight of such names imposes it upon me as a duty, not to bring forward my

* From *Annalen der Physik*, von J. C. Poggendorff, Leipzig, 1839.

own views until they are found to be sufficiently clear to afford definite conclusions. Hitherto, it has appeared to me to be especially necessary to be enabled accurately to ascertain the force of the stream at each instant, and on each experiment, a proposition of the practicability of which I have perfectly satisfied myself by means of the Multiplier of M. Nervander Von Helsingfors. My first endeavour was therefore to procure a similar instrument, and the most perfect of its kind, in which I have not yet succeeded for want of a proper material.

I have discovered, by means of many experiments, that all kinds of native copper act upon the magnets of other multipliers, although by chemical test I could discover no trace of the presence of iron. These experiments, as well as those of others, have convinced me that copper is slightly magnetic—or, if we follow the lately expressed opinion of Faraday—that the ordinary temperature of about 15° R. is not sufficiently high to deprive copper of its magnetism. Unwilling longer to delay my experiments, there remained to me no alternative but to choose such metal as exhibited in the least degree this counteracting power; and this I found to be brass. The apparatus constructed of this material bids fair to answer the desired end, as far as may be judged by the effect upon a simple needle. On account of its great flexibility, I have chosen silver for the winding wire, and as soon as I shall have concluded a course of trials of this apparatus, I will commence my experiments, and shall not fail to communicate the results to the academy: and, in the meantime, I will, *in limine*, bring under consideration certain points, which although lightly held, in the estimation of the defenders of the chemical theory, at least justify us in not falling unconditionally into their views.

In the first place, I will speak of the *resistance to transition* which the galvanic stream encounters on passing from a fluid to a metal, or from a metal to a fluid. This *resistance* was first treated of by Fechner, although it had been also observed by others. As this resistance has been, in some quarters, denied to exist, I here beg permission to prove its existence, by other means than those adopted by Fechner to the same end; and I trust that my experiments will leave no doubt of its existence. For this purpose I employed the apparatus, by means of which I have, in many treatises, exhibited the influence exerted by the conducting wire on the passing stream. I raised the magnetic stream in a spiral which surrounded the cylindrical magnet, and obtained thereby a stream of a constant magnetic power, which could be estimated by the needle. But in these trials, instead of bringing the circuit into the wire, too susceptible with regard to its conducting power, this was done only with the apparatus represented by the annexed diagram, in which A B represents a board with two vertical columns, AC and BD. Through the latter the copper wires are bent, MFH and NGK, as in the figure, and the points H and K are made to approach each other at pleasure, as are also L and P, which are metal plates of an inch square screwed on this part. The latter are in a glass vessel *ab*. The ends, FM and GN, of the copper wires, dip into small mercury caps, and come out with the end of the multiplier and the spiral. By now bringing the plates L and P in contact, and passing the stream through the apparatus, we may be readily convinced that the force of the stream is equal, what metal soever we employ.



Having convinced himself of this, let the operator place the plates again at a distance from each other, say of a line; then let him pour into the vessel a conducting fluid, and compare the force of the stream raised in the spiral by the employment of plates of platina, with that produced when copper plates are substituted; and the stream in the latter case will be found the more powerful, as the needle will indicate a bias of 47°, while in the former the result will be only 9°.

Thus, in these experiments, all the circumstances are known; the susceptibility of solid conductors, that of fluids, the removal of the plates, their surfaces, &c., &c.: and there exists between them only the distinction that the stream in one case passed from platina to a fluid, and from the latter to platina again; while in the other it passed from copper to a fluid, and thence again to copper. Hence there is only a distinction in the passage from the metal to the fluid; and as this produces a difference so sensible in the power of the stream, there must necessarily be a resistance in platina much more marked than in copper.

Similar experiments are available, in determining precisely the amount of this resistance with regard to that of the conducting fluid; or that of the solid conductors in the circuit. For this purpose it is only necessary to operate with each double plate at two distinct distances. Let these distances be d' and d'', the resistance of the solid conductor 1, that of transition λ, that of the fluid at the distance $= 1 - l$, and by taking, as Fechner has done, the resistance proportionable to the distance of the plates, if a, a', and a'' represent the half of the angle of de-

viation of the multiplying needle, for the distance d, and for the distance d'', consequent terms for l and λ may readily be found.

$$l = \frac{2.\ \sin.\ a, \cos.\ \frac{1}{2}(a'+a'').\ \sin.\ \frac{1}{2}(a'-a'')}{(d''-d')\ \sin.a'.\ \sin.\ a''}$$

$$\lambda = \frac{\sin.\ a}{\sin.\ a'} - 1 - d'\ l.$$

I have instituted some preliminary experiments, and have found that platina, in diluted acid, offers a resistance about twenty times greater than that of copper with acid: I have, however, not yet reduced these experiments to that nicety at which I hope in time to arrive. The resistance undergoes a marked change, during immersion in the acid, and it is this circumstance which renders the calculations difficult. Another class of experiments tried the independence of this resistance, of the strength of the acid—on the transition of the stream from copper to water, I discovered the resistance to be—with

2 per cent. acid	. . .	= 90093·2
4 —	. . . .	= 51848·9
6 —	. . . .	= 26627·2

taking as the unit the resistance to the conducting power of a copper wire of one inch long and three-quarters of a line in diameter. Although these numbers are not to be considered perfectly accurate, they leave no doubt of the proposition, that the resistances of transition bear an unlimited relation to the chemical effect of the fluids, and the metals in contact with them; a principle which coincides perfectly with Fechner's earlier researches. Thus there exists a cause which operates to the effect that the stream of a galvanic circuit increases with the chemical effect of its elements, and the source of the generated electricity may be charged at will: thus the fact of the force of the stream being independent of the chemical action is no proof in favour of a chemical view of the excitation of electricity; as the resistance of transition, which constitutes by far the greater part of the collective resistance of the circuit, satisfactorily shows, that by employing pure water and sulphuric acid the stream is insignificant, but it becomes very powerful on the substitution of diluted acid; and the principle is unquestionably the greater chemical action, not necessarily by the increase of the electro-motive power, but by the diminution of the resistance.

This leads us to another point deserving of consideration in determining the value of both theories; and especially important in the subject of galvanic streams. I have in another place expressed myself more at length, and shown how prejudicial has been the want of due attention to the conducting powers of various metals. I may here allude to the view taken by Ohm, which describes the stream in a very simple formula:

$$F = \frac{A}{L}$$

in which F represents the force of the stream, A the amount of the collective electro-motive powers, and L the sum of the collective resistances of the conductng powers. Abundant observations and my own researches, through magneto-electric induction, prove the accuracy of this formula, while the stream passes only through solid conductors. The observations of Fechner have been equally conclusive with regard to the hydro-electric chain, although the precision may not be so striking, in consequence of the subtlety of the phenomenon. The rejection of this simple proposition has produced innumerable errors in the conclusions drawn from experiments. I may instance Becquerel's view; he, with his galvanic chain, may produce strong chemical action, but not the phenomena of heat. His apparatus is composed of acid, kali, and platina (Poggen. Ann., vol. xxxvii, p. 433). The explanations may be as follows: Let the electro-motive power, which produces the stream in Becquerel's apparatus, = A; leaving it undetermined where the seat of this power is to be found. The resistance which the conductors oppose to the stream consists of three individual minor resistances; that of the connecting wires ($= L$); that of the fluid ($= l$); and that of the transition ($= \lambda$) from the platina to the acid and the kali. The stream is expressed by this formula;

$$F = \frac{A}{L + l + \lambda}$$

In this L is estimated little beyond 0, in consequence of the proportionally great conducting powers of the metals; l, in like manner, is of considerably less value than λ, since between the plates and the fluid no chemical action arises. This premised, we will assume (as according to Becquerel) that instead of L another wire of n times smaller diameter is introduced into the chain, by which means this almost infinitely small portion of the denominator becomes n times increased, which produces nothing equivalent to any diminution in the denominator, nor, consequently, in the stream; hence then the multiplier does not affect the declination of the needle. Becquerel increased the surface of the platina n times, thus diminishing n times a great portion of the denominator, as the resistance of transition bears inverse proportion to the surface; F becomes thus almost n times increased, and it follows that the evolution of gas, which is

proportionable to the stream, was charged in the same relation as the immersed surfaces of the plates of platina. But that the evolution of heat in the thin platina wire was = 0, arose from the weakness of the stream: indeed in an apparatus very similar to that of Becquerel, in which the evolution of gas was considerable, the multiplier declared a diversion of only 22°, the stream not being much weakened: of this I convinced myself by the introduction of a second wire, the resistance of which was nearly equal to that of the multiplier. We have been accustomed to consider the evolution of gas as the consequence of a powerful stream, because in making the experiment, a considerable column is necessary. But this only takes place because there is required a stream capable of overcoming a considerable resistance within the column, and the denominator increases in denoting the power of the stream, therefore F is accordingly diminished.

Another point, which has been long known but not duly considered, is the change to which metals are subjected in respect of electro-motion (be it with regard to each other in the Voltaic, or with regard to the fluid of the chemical theory) when immersed in fluid. From a series of experiments, instituted with the above-mentioned apparatus of Becquerel, I am led to believe that I have arrived at the fact, that the effect upon this modifying influence of the acid and the alkali depends upon the plates of platina, and not upon the chemical operation of the fluids. In the meantime, as the proof is not yet sufficiently satisfactory to me, I will proceed no farther with the subject until the next communication, especially as this circumstance carries us far into the debate on the two views, a position which I would, if possible, avoid.

NOTE ON CHLOROSULPHURIC ACID.

BY M. V. REGNAULT.

In my first investigations respecting chlorosulphuric acid, I had not succeeded in obtaining that compound pure by the direct combination of chlorine and sulphurous acid. Flasks, filled with a mixture of the two gases, had remained exposed to the sun for several days, without the least alteration being observable. The sun was probably not sufficiently intense at the period of making these experiments; it was the month of September; but afterwards, by means of the great heat which we had in the month of June, I was more fortunate. Flasks, filled with a mixture of chlorine and sulphurous acid very dry, being exposed to the direct rays of the sun, exhibited, after some days' isolation, a white vapour, which became condensed in little drops on the sides. The quantity of liquid produced was increased on the subsequent days, so that it became easy to get it out of the flasks. The combination of the whole of the mixed gases was not, however, determined; it is probable that their affinity ceases when they have arrived at a certain state of rarefaction.

Five flasks, of the capacity of 20 litres, gave me 20 gr. of chlorosulphuric liquid. I purified it by distilling it on mercury, and rejecting the first portions which contained dissolved sulphurous acid.

I verified on this liquid some of the results which I had obtained in my first effort on the liquid mixed with Dutch oil.

The density of the liquid was found to be 4·659 at 20°; its boiling point about 77°. The density of its vapour was found to be 1·665. The calculated density is 4·652.

ON SULPHATE OF CHLORIDE OF SULPHUR.*

BY H. ROSE.

Some attempts which were made to convert the sulphate of chloride of sulphur, $S\,\overline{Cl^3} + 5\ddot{S}$, by taking sulphuric acid from it, into a compound analogous to the chromate of chloride of chromium, $Cr\,\overline{\ddot{Cl}^3} + 2Cr$, did not yield satisfactory results.

If chloride of sodium be treated with sulphate of chloride of sulphur, they unite to form a solid transparent mass, which does not emit fumes, but which when heated yields a vapour having a strong smell of chlorine, and which nevertheless is undecomposed sulphate of chloride of sulphur, containing free chlorine. If it be submitted to distillation, the latter escapes as soon as ebullition occurs. By the decomposition of the chloride of sodium sulphurous acid is eventually disengaged, and there remains a mixture of super-sulphate of soda and undecomposed chloride of sodium.

The sulphate of chloride of sodium [sulphur?] decomposes at a temperature much above its boiling point. If the vapour be conveyed through a glass tube heated to redness, chlorine gas as well as sulphurous acid are evolved, but the presence of the latter is not discoverable on account of that of the former. The liquid obtained, after

* *L'Institut*, Août 1839.

numerous researches into its nature, appeared to be a solution of anhydrous sulphuric acid in sulphate of chloride of sulphur, in which the first partly crystallizes by cooling. It is not possible to procure by this process, a definite compound of chloride of sulphur and sulphuric acid.

The specific gravity of the vapour of sulphate of chloride of sulphur, was found by a mean of five trials to be 4·481. Supposing it to be a compound of 6 volumes of chlorine representing 3 double atoms, and 2 volumes of vapour of sulphur, corresponding to 6 atoms, and 15 volumes of oxygen, the calculated density would be 44·489 or 10 x 4·489. This result agrees well with the experiments, when it is considered that in this compound 23 volumes are condensed into 10. Each atom of the compound corresponds to 10 volumes of vapour.

M. Walter has proposed to consider the chromate of chloride of chromium as a chromic acid, in which an atom of oxygen is replaced by an equivalent of chlorine. If this view be applied to the sulphate of chloride of sulphur, it would also be a sulphuric acid, in which half an atom of oxygen is replaced by half a double atom of chlorine. In this case the compound would contain ½ a volume of sulphur, 1 volume of chlorine, and 2½ volumes of oxygen, and the calculated density of its vapour would be 7·414. In this case a very peculiar condensation must be supposed to occur, and yet the numbers would not agree with the experiment; from which it must be concluded, that the sulphate of chloride of sulphur, as it has hitherto been termed, is a compound of sulphate and of a chloride of sulphur which has not yet been isolated.

The sulphate of chloride of sulphur may be prepared by a much more simple process than that hitherto employed; it is effected by mixing chloride of sulphur with good Nordhausen sulphuric acid, and submitting the mixture to distillation with a gentle heat. It is thus obtained, mixed with hydrated sulphuric acid, from which it may be separated by a fresh distillation.

When a large quantity of anhydrous sulphuric acid is conveyed into a small quantity of chloride of sulphur, a blue compound is obtained. As it is very probable that chloride of sulphur is a solution of sulphur in a chloride of sulphur $S\overline{Cl^2}$, not yet isolated, the blue colour may be derived from the combination of this dissolved sulphur, it being well known that sulphur gives a blue solution with an excess of anhydrous sulphuric acid.

PURPURIC ACID.

M. Fritzche in January last, read before the Academy of Sciences of St. Petersburgh a notice respecting purpuric acid and its salts.

It is not long since that the name of purpuric acid was given to a substance discovered by Prout, which had neither a purple colour, nor possessed acid properties, but it was so named, because it was extracted, by means of an acid, from purpurate of ammonia. The researches of Liebig and Wöhler on the products of the decomposition of uric acid by nitric acid, have proved that this substance is the product of the complete decomposition which purpurate of ammonia undergoes by most acids, and they have consequently given it the very proper name of *murexane*; but this is not the case with the new name of *murexide*, which these chemists have applied to purpurate of ammonia on account of its not being a salt but an *amide*. This principle could be correct if only one ammoniacal body could be thus formed; but in the year 1848, Prout had shown that a great number of other purpurates could be obtained with the purpurate of ammonia; and soon afterwards Vauquelin described the properties of purpurate of silver: more lately Kodweis analysed the purpurate of barytes; and from this period the purpurates are described in all treatises on chemistry, although the composition of purpuric acid is unknown, and it was known only that it transformed ammoniacal salts into another class of substances. The memoir of M. Fritzche has for its object the reestablishment of the name of purpuric acid, to prove that it really exists as an acid in the salts which have been called purpurates, which is known only in combination with bases, to analyse the purpurates, and to supply the deficiencies which still exist as to our knowledge of the compounds which this acid may form. The following are the results obtained by M. Fritzche.

Purpuric acid has not yet been isolated; when attempts are made to separate it from its combinations by means of acids, it is decomposed, and yields, in dilute solutions, principally *murexane*, whereas with concentrated solutions it forms other products. Purpuric acid forms with bases, salts which are slightly soluble, and remarkable for the fine purple colour of their solutions. Besides these neutral salts, in which the base is to the acid as 1 to 10, it forms basic salts also, but not acid salts. When perfectly free from water, purpuric acid consists of

Hydrogen.....	1·581	= H^8
Carbon.....	38·725	= C^{16}
Oxygen.....	31·665	= O^{10}
Azote	28·029	= N^{10}
	100·	

PURPURATE OF SILVER.

This salt, first obtained by Prout, was dried at 266° Fahr. It was analysed by the usual methods, and gave by

	Experiment.	Calculation.	
Hydrogen.....	1·31	1·32 or	H^{10}
Carbon.....	25·75	25·89	C^{16}
Oxygen.....	23·19	23·30	O^{11}
Azote	19·02	18·75	N^{10}
Oxide of silver..	30·73	30·74	Ag
	100·	100·	

The basic purpurate of silver is obtained by adding ammonia to nitrate of silver until the precipitate is redissolved, and with this solution purpurate of ammonia is to be precipitated. The author could not effect the analysis of this salt, for having exposed it to a temperature of 392° Fahr. in an oil-bath, the whole mass was decomposed.

PURPURATE OF POTASH.

This salt was obtained by Prout, who recommends it to be prepared by decomposing a boiling solution of purpurate of ammonia by means of a solution of bicarbonate of potash; but as it is in this method impossible to avoid a disengagement of ammonia, which when heated acts upon the purpurate, it is better to employ nitrate of potash. The purpurate of potash is difficultly soluble in water, but not insoluble; it is much less soluble in saline solutions: on this account it is proper to employ great excess of nitre in preparing it. This purpurate is pulverulent, and consists of very small reddish brown microscopic crystals; it may also be obtained in large crystals, which have the colour and lustre of the ammoniacal compound, or perhaps rather deeper. The analysis of this salt, carefully performed, gave

	By Experiment.	Calculation.	
Hydrogen.....	1·33	1·33 or	H^{8}
Carbon.....	31·23	32·63	C^{16}
Azote	24·05	23·62	N^{10}
Potash	15·48	15·73	K
		26·69	O^{10}
		100·	

The indigo blue liquid which is obtained when purpurate of ammonia is dissolved in a solution of caustic potash, is probably derived from the formation of a basic salt, which cannot be procured in a solid form.

PURPURATE OF AMMONIA.

The properties of this salt are perfectly well known by the experiments of MM. Liebig and Wöhler, but still neither the composition nor the formula which they have given is correct. In order to procure this salt, which is prepared with difficulty by the usual methods, M. Fritzche employed a process which yields it readily and in great abundance. This process is derived from the observation he had made, that a large quantity of purpurate of ammonia may be formed by the action of ammonia on pure alloxane; when a concentrated and boiling solution of alloxane is gradually added to a solution of carbonate of ammonia, carbonic acid is disengaged with strong effervescence; the solution on each addition assumes a deeper purple tint, and at last it becomes turbid and precipitates a great quantity of reddish powder, which consists of pure anhydrous purpurate of ammonia. Instead of using pure alloxane, concentrated but not fuming nitrate of uric acid may be employed, taking care to adopt the precautions given by Liebig and Wöhler for the preparation of alloxane. Purpurate of ammonia is not the only product of the operation, but as the composition of the others produced is not known, it would be difficult to give a plausible explanation of the formation of this salt. The analysis of purpurate of ammonia dried at 212° Fahr. yielded M. Fritzche results which differed from those obtained by MM. Liebig and Wöhler. These successive experiments gave

Hydrogen ..	2·82	2·84	2·83
Carbonic acid	34·78	34·43	35·52
Azote	30·70	30·89	

The mean of these analyses agrees very well with the following view:

	Experiment.	Calculation.	
Hydrogen ..	2·83	2·86 or	H^{16}
Carbon	34·91	35·10	C^{16}
Oxygen	31·47	31·56	O^{11}
Azote	30·79	30·48	N^{12}
	100·	100·	

The crystals of purpurate of ammonia contain water of crystallization, amounting according to Liebig and Wöhler to 3 or 4 per cent., whereas M. Fritzche found as the mean of eight experiments on very pure crystals 6·06 per cent.

PURPURATE OF BARYTES.

This salt is obtained by mixing a solution of barytes with a moderately concentrated solution of purpurate of ammonia; the liquor becomes turbid, and a blackish green powder is deposited, which by friction becomes of a deep purplish red. M. Kodweis has given an analysis of this salt to fix the

atomic weight of murexane, but the result shows, that he had not sufficiently dried it: taking care to do this, M. Fritzche obtained by

	Experiment.	Calculation.	
Hydrogen ..	1·717	1·725 or	H^{12}
Carbon	27·980	28·180	C^{16}
Barytes	21·960	22·045	Ba
Oxygen		27·650	O^{12}
Azote.....		29·100	N^{10}
		100	

So that this salt dried at 212° would contain 22·045 of barytes, 72·772 of purpuric acid, and 5·83 of water; and dried at common temperatures, barytes 19·98, purpuric acid 65·94, and water 14·08.*

ACTION OF FERROCYANIDE OF POTASSIUM ON CHLORIDE OF CALCIUM, ETC.†

M. Reiset added a solution of ferrocyanide of potassium to one of chloride of calcium: the well-known white, crystalline and slightly soluble precipitate was obtained, which he found to consist of one equivalent of ferrocyanide of potassium and one equivalent of ferrocyanide of calcium. He further observed that compounds of analogous constitution are formed when the salts barium, strontium, or magnesium are substituted for those of calcium.

The crystals obtained when a solution of chloride of barium is poured into a hot solution of ferrocyanide of potassium, and which are described in many chemical treatises as being pure ferrocyanide of barium, are composed of 1 equivalent of ferrocyanide of potassium and 1 equivalent of chloride of barium. The ferrocyanide of ammonia also possesses the property of combining atom to atom with the earthy ferrocyanides.

NOTICE FROM DR. HARE, PROFESSOR OF CHEMISTRY, RESPECTING THE FUSION OF PLATINA, A NEW ÆTHER, AND A SERIES OF GASEOUS COMPOUNDS FORMED WITH THE ELEMENTS OF WATER. ‡

TO PROF. SILLIMAN.

Philadelphia, Dec. 15th, 1838.

My dear Friend,—I send you for the Journal a brief notice of some results, observations, and inferences, which are nearly in the same language in which they were communicated to the Chemical Section of the British Association for the Advancement of Science.

I have by improvements in my process for fusing platina, succeeded in reducing twenty-five ounces§ of that metal to a state so liquid, that the containing cavity not being sufficiently capacious, about two ounces overflowed it, leaving a mass of twenty-three ounces. I repeat, that I see no difficulty in extending the power of my apparatus to the fusion of much larger masses.

When nitric acid or sulphuric acid with a nitrate is employed to generate æther, there must be an excess of two atoms of oxygen for each atom of the hyponitrous acid which enters into combination. This excess involves not only the consumption of a large proportion of alcohol, but also gives rise to several acids and to some volatile and acrid liquids.

It occurred to me that for the production of pure hyponitrous æther a hyponitrite should be used. The result has fully realized my expectations.

By subjecting hyponitrite potassa or soda to alcohol and diluted sulphuric acid, I have obtained a species of æther which differs from that usually known as nitrous or nitric æther in being sweeter to the taste, more bland to the smell, and more volatile. It boils below 65° of F., and produces by its spontaneous evaporation a temperature of 0—15° F. On contact with the finger or tongue it hisses as water does with red-hot iron. After being made to boil, if allowed to stand for some time at a temperature below its boiling point, ebullition may be renewed in it apparently at a temperature lower than that at which it had ceased. Possibly this apparent ebullition arises from the partial resolution of the liquid into an aëriform æthereal fluid, which escapes, both during the distillation of the liquid æther and after it has ceased, at a temperature below freezing. This aëriform product has been found partially condensable, by pressure, into a yellow liquid, the vapour of which, when allowed to enter the mouth or nose, produced an impression like that of the liquid æther. I conjecture that it consists of nitric oxide, so united to a portion of the æther as to prevent the wonted reaction of this gas with atmospheric oxygen. Hence it does not produce red fumes on being mingled with air.

* *L'Institut*, No. 304.

† *L'Institut*, August, 1839.

‡ *American Journal of Science and Arts*, vol. 35, No. 2.

§ Troy weight. The actual quantity fused was 12,250 grs.; the lump remaining weighed 10,937 grs.

Towards the end of the ordinary process for the evolution of the sweet spirits of nitre, a volatile acrid liquid is created which affects the eyes and nose like mustard, or horse-radish.

When the new æther as it first condenses is distilled from quick-lime, this earth becomes imbued with an essential oil which it yields to hydric æther. This oil may be afterwards isolated by the spontaneous evaporation of its solvent. It has a mixed odour, partly agreeable, partly unpleasant. From the affinity of its odour, and that of common nitrous æther, I infer that it is one of the impurities which exist in that compound.

The new æther is obtained in the highest degree of purity, though in less quantity, by introducing the materials into a strong well-ground stoppered bottle, refrigerated by snow and salt. After some time the æther will form a supernatant stratum, which may be separated by decomposition. Any acid, having a stronger affinity for the alkaline base than the hyponitrous acid, will answer to generate this æther. Acetic acid not only extricates but appears to combine with it, forming apparently a hyponitro-acetic æther.

I observed some years ago that when olefiant gas is inflamed with an inadequate supply of oxygen, carbon is deposited, while the resulting gas occupies double the space of the mixture before explosion. Of this I conceive I have discovered the explanation. By a great number of experiments, performed with the aid of my barometer-gauge eudiometer, I have ascertained that if during the explosion of the gaseous elements of water any gaseous or volatile inflammable matter be present, instead of condensing there will be a permanent gas formed by the union of the nascent water with the inflammable matter. Thus two volumes of oxygen, with four of hydrogen, and one of olefiant gas, gave six volumes of permanent gas, which burns and smells like light carburetted hydrogen. The same quantity of the pure hydrogen and oxygen with half a volume of hydric æther gives on the average the same residue. One volume of the new hyponitrous æther under like circumstances produced five volumes of gas.

An analogous product is obtained when the same aqueous elements are inflamed in the presence of an essential oil. With oil of turpentine a gas was obtained weighing per hundred cubic inches $16\frac{4}{10}$ grs., which is nearly the gravity of light carburetted hydrogen. The gas obtained from olefiant gas, or from æther, weighed on the average, per the same bulk $13\frac{4}{10}$ grs. The olefiant gas which I used weighed per hundred cubic inches only $30\frac{4}{10}$ grs. Of course if *per se* expanded into six volumes, it could have weighed only one-sixth of that weight, or little over five grains per hundred cubic inches. There can therefore be no doubt that the gas obtained by the means in question, is chiefly constituted of water, or of its elements in the same proportion H^2 O.

With a volume of the new æther, six volumes of the mixture of hydrogen and oxygen give on the average about five residual volumes. The gas created in either of the modes above mentioned does not contain carbonic acid, and when generated from olefiant gas appears by analysis to yield the same quantity of carbon and hydrogen as that gas affords before expansion.

These facts point out a source of error in experiments, for analyzing gaseous mixtures by ignition with oxygen or hydrogen, in which the consequent condensation is appealed to as a basis for an estimate. It appears that the resulting water may form new products with certain volatilizable substances which may be present.

From the account of the proceedings of the Section, published in the Athenæum, it appears, that after my letter, in which the facts above-mentioned were stated, was read, a Mr. Maugham, who is employed to exhibit the hydro-oxygen microscope at the Adelaide Gallery, London, asserted that I had accomplished the fusion, of which mention has been above made, by means of a blowpipe of his contrivance, which I had purchased while in London.

The opinion which I am obliged to entertain of an individual capable of this groundless assertion, would cause me to consider him unworthy of notice, had not his mis-statement been made before an assemblage which I most highly esteem, and had he not been honoured by a premium for his pretended invention by a respectable British Society.

The blowpipe which is thus falsely alleged to have been used by me, differs immaterially from one of which I published an engraving and description in the American Journal of Science for 1820, vol. ii. p. 298, being a modification of that originally contrived by me and republished in Tilloch's Philosophical Magazine, vol. xiv. for 1802.

Between the instruments described in these publications, or in the Franklin Journal, and that employed by Maugham, the only difference worthy of notice is, that the latter is near the apex bent so as to form an acute angle, and is thus rendered suitable for directing the flame upon a revolving cylinder of lime.

Although I purchased of Newman a blowpipe bent as described, with an apparatus attached for holding and turning a cylinder of lime, *I have never made any use of it*, having for the purpose of subjecting lime to the flame, found my modification

above referred to as described in this Journal, preferable. It only required the jet-pipe to be directed upwards in an angle of about forty-five degrees with the axis of the lime cylinder.

I do not consider the form of my blow-pipe employed by Mr. M. as qualified for the fusion of any metal.

It is remarkable that an apparatus of gasometers employed by Maugham at the Adelaide Gallery for the supply of the gases for the blowpipe differs but little from the apparatus proposed for the same purpose in my communication above adverted to, and published nearly twenty years ago.

However the process by which I have lately extended the power of the hydro-oxygen blowpipe may differ from those to which I had previously resorted, it differs still more from that modification which Maugham has claimed as his own.

MEMOIR OF M. KUHLMANN RELATIVE TO THE PROPERTIES OF PARTICLES OF PLATINA, AND TO THE PHENOMENA OF ETHERIFICATION.

REPORTED BY M. PELOUZE.

Since the discovery made by Doebereiner of the singular properties of particles of platina, the facts with which it enriched the science remained confined to four: the transformation of alcohol into vinegar; that of pyroligneous into formic acid; the production of ammonia by the contact of deut-oxide of azote with hydrogen; and, lastly, the combination of sulphurous acid with oxygen to form sulphuric acid. M. Kuhlmann has taken up the question at this point, and has arrived at new results very interesting. All the compounds of azote are transformed into ammonia by the contact of hydrogen free or carburetted; only, in this last case, hydrocyanic acid is also produced. With the exception of azote, all the gaseous or vaporizable metalloids combine with oxygen under the influence of platina. All the compounds of azote, we have said, are transformed into ammoniac by hydrogen; moreover, they are transformed into nitric acid by oxygen. Accordingly we may make at will nitric acid with ammonia, and ammonia with nitric acid.

The second part of the memoir of M. Kuhlmann is quite distinct from the first, and treats of etherification. It is known that several substances having an affinity to water will transform alcohol into ether; such are sulphuric, arsenic or phosphoric acid, the fluorides of boron and of silicium. Lastly, M. Masson has recently observed the same property in chloride of zinc. M. Kuhlmann has made experiments on the anhydrous bi-chloride of tin. This body combines in several proportions with alcohol, and forms brilliant, colourless, compounds, which easily crystallize. Water decomposes them rapidly. The chloride of tin combines with pure alcohol, with great disengagement of heat. This combination, obtained with an excess of pure alcohol, gives, at about 140°, a considerable quantity of sulphuric ether. If, on the contrary, the chloride of tin is in excess, we obtain only hydrochloric ether, olefiant gas, and sweet oil of wine. Similar results take place with the anhydrous chlorides of antimony and iron; this last in particular gives rise to a remarkably clear reaction. The ether is produced at about 130°, without bringing with it either water or sweet oil of wine. It is the easiest and surest mode of immediately obtaining ether of perfect purity. Pyroligneous acid substituted for alcohol, produces an analogous effect. These two substances also combine with the alkalies, producing a negative effect; but it is impossible to obtain ether from these combinations. On the contrary we may always obtain it from those combinations in which alcohol and pyroligneous acid act positively, and are found in a small excess. But it is remarkable that it is always at about 140° that the ether is produced; it seems that this is the temperature in which the elements of alcohol begin to become independent so as to be able to form new combinations. M. Pelouze desired the insertion of this memoir in the collection of scientific foreigners; which demand was complied with.

EARTHQUAKES IN CHILI.

M. Dumoulin, engineer and hydrographer, on board the corvette *Astrolabe*, commanded by M. Dumont Durville, has transmitted from Valparaiso to M. Arago, various details which he collected, by direction of the Academy, on the earthquakes which have occurred frequently in Chili for some years past.

From the general tenor of these documents it appears, contrary to the opinion generally entertained, that the earthquakes are not more frequent in one season than in another. This results from an observation of 150 shocks remarked during the year 1833 alone, at Conception, by M. Vermoulin, a French physician, and of 1200 of those phenomena, of which the same observer carefully noted the hour and date from the 20th of February 1835.

No one doubts, at Chili, that the earthquakes have the property of lifting up the

ground. The people even have a particular expression to designate that effect: they say that *the earth remains suspended* (*suspendida*). They add, that the suspension is never the effect of *horizontal shocks: it is only the undulatory shocks* that can produce it.

On the subject of the elevation of the ground consequent on the earthquake of the 20th of February 1835, on the coast of Chili, we will now give some extracts from the letter of M. Dumoulin, which may be placed with those which Captain Fitzroy collected at the time.

Opposite Fort St. Catherine, at Talcahuano, there is a shelf of rocks extending to the land, and terminated, towards the open sea, by a head which used to be covered by the lowest tides; from the 20th of February it has remained constantly uncovered; scarcely do even the highest tides bring the level of the water to its summit.

The little river Fabul, 22 or 23 leagues from Talcahuano, which was in 1835 still navigable for small vessels as far as 300 metres above its mouth, became fordable after the earthquake of the 20th of February 1835; it was remarked every where that the beds of the rivulets and small rivers had been raised.

"Coste, captain of a whaler, now commanding the *Ocean*, has for a number of years frequented the seas off the coast of Chili. In looking through his journals, we have succeeded in collecting some data which will leave no doubt respecting the lifting up of the ground consequent on the earthquakes.

On the 15th of February 1834, he chose his anchorage under shelter of the Island of St. Mary, and let fall his anchor in 29 feet of water. He did not leave that anchorage until the 15th of May. In the following year, 1835, on the 3d of May, he came to resume his anchorage near the island of St. Mary. On careful examination, he could not find more than 20 feet of water for anchorage, and at length he dropped his anchor in the place which he had occupied the preceding year. On going ashore he perceived a general disorder. The coast had changed its aspect in consequence of the tumbling of the ground. What struck him above all was, that some rocks which used never to be uncovered at low water, and on which he used to send his men to fish, with the water up to their middle, were now exposed to view and not covered even at high water. He questioned the inhabitants of the country on these changes, and learned that they were the consequence of the earthquake which desolated those regions on the 20th of February 1835. The whole night his ship laboured much by the rushing of the sea, occasioned by continual small shocks. The next day he set sail, fearing to retain so dangerous an anchorage.

On the day of the earthquake (20th of February 1835), Captain Coste had anchored his vessel near the island of Lemus. He experienced there the weakened effects of the earthquake. At noon, a violent rush of the tide was sufficiently strong to break the chains of the ships *Narwal* and *Gange*, which were with him at anchor.

On the 17th of November 1837, being in 43° 18′ South Lat., in sight of land, his masts were shaken, and his ship agitated by the earthquake which destroyed Valdivia.

On the 11th of December 1837, he came to resume his anchorage near the island of Lemus. The shock of the 7th of December had raised the bottom more than 8 feet. Some rocks, which formerly had been always covered by the sea, now remained constantly exposed. An enormous quantity of shells, and fish in a state of decomposition, thrown on the shore either by a sudden elevation or by the oscillations of the sea, shewed that the event had been of recent occurrence. A great quantity of trees, torn up by the roots and carried to sea in those shocks, were to be seen along the shore.

SEPARATION OF LIME FROM MAGNESIA.*

BY M. DOEBEREINER.

When chloride of magnesium very anhydrous is heated, that compound absorbs oxygen, and yields its chlorine. This decomposition, that is, the transformation of the chloride of magnesium into magnesia, is effected more rapidly when the chlorate of potash is used instead of air. This reaction permits the separation of the lime from the magnesia, and in the easiest manner. The mixture, or compound of dolomite, for example, which contains these two earths, is dissolved in hydrochloric acid; the solution is evaporated to dryness, the remainder is heated in a capsule in platinum so long as hydrochloric acid is disengaged, and when the mass is heated so as to be growing red, chlorate of potash is added to it in small portions, until there is no longer a developement of the least trace of gaseous chlorine. The mass which remains after the evaporation consists in a mixture of chloride of potassium and of chloride of magnesium, which it is easy to separate by exposing them to the action of water, filtering the solution, precipitating the liquid by the carbonate of soda, &c. The author has convinced himself, by a great number of experiments, that the chloride of many

* From *Jour. für pract. Chemie*, xvi.

metallic minerals may be decomposed in the same manner, and thus transformed into oxide, while the chloride of many other metals experiences no decomposition.

MEMOIR ON THE NUTRITION OF PLANTS.

BY M. PAYEN.

The author has proposed to himself in this essay to develop the chemical theory of the nutrition of plants. He shews that in the cambium, or liquid preceding the vegetable formations, a granulous, contractile substance, appears in the first instance. Its composition is azotic; it must assimilate to itself a nourishment of similar composition. This substance, being gradually developed, is soon enclosed in cells, the membranes of which are composed solely of carbon, hydrogen, and oxygen, in the proportions requisite to form water. These three elements must therefore be among the agents of vegetable nutrition. The author afterwards remarked the formation of a substance of which the composition, rich in carbon, gives a proportion of hydrogen three times more considerable than that which would, with its oxygen, constitute water. He deduces from this new fact the explanation of the necessity of an excess of hydrogen in vegetation, and of the water which yields it. The production of this hydrogenous matter, of a thick consistence, employs the greatest part of the hydrogen, which is in excess in cryptogamous and herbaceous plants. To this are joined, for these ligneous plants, considerable portions of hard incrusting matter.

THE INFLUENCE OF COLD ON CAPILLARY CIRCULATION.

BY M. POISSEVILLE.

In my memoir upon the causes of the motion of the blood through the capillary vessels, I have examined particularly the action of heat and cold upon capillary circulation. I observed, the temperature being 20° C, that by putting particles of ice in a receptacle, as, for instance, a bullet-head, the circulation in the capillary tubes became slower and slower, the globules separated, becoming deranged in form as they sought to make way across these vessels, and they resumed their primitive form when passing through vessels of a larger calibre. By a longer stay in water at a temperature of 1° to 2°, the circulation ceases in the greater number of capillary tubes, and if we then measure the calibre of these vessels, we find their diameters varying from 0·018 to 0·020 of a millimetre from before the ice was applied; but if we maintain this low temperature by means of a new supply of ice, at the end of a certain time the globules of the capillary vessels in which the circulation had entirely ceased, would undergo a slight disturbance through the influence of the contractions of the heart. These oscillations of the globules acquiring a greater and greater amplitude, very soon change into a progressive motion, which becomes more and more rapid; so that, at the end of about three quarters of an hour, the circulation is as quick in this ambient medium, which is some degrees above zero, as in the open atmosphere. Certain vessels, which, previous to the action of the ice, gave way to two or three globules in front, offer no more than one single rank of globules which move on their axis. The latter vessels, as also those of a greater calibre, appeared not to have changed their volume; but the capillary vessels, which then produce a circulation as quick as in the normal state, have a greater diameter. The diameter of from 0·018 to 0·020 of a millimetre, when all the circulatory motion was destroyed, became 0·022, 0·024, 0·026, 0·030, and 0·034 of a millimetre; that is to say, the capillary vessels had doubled and trebled their volume. Some few other capillaries, which were quiescent, had not, as in the case of the preceding ones, augmented their calibre. If we remove the ice, the circulation is soon re-established in these latter vessels, and at the end of a few hours, all the capillaries resume their primitive volume.

Thus, under the influence of the contractions of the heart, the *living* tubes would acquire, by a prolonged action of cold, a more considerable volume.

Having preserved during the winter some bull-heads which were collected in July, I found that in January their capillary vessels were augmented in volume. The place occupied by these insects was at a temperature of two degrees above zero.

The same experiments made upon the bladder of very young mullets presented much greater difficulties. In fact, from the moment that the ice comes in contact with the capillaries of these mammiferous animals, and continues but for a few minutes, the circulation decreases, and finally is entirely destroyed. But if we replace the ice by some water at 10 or 12 degrees (the circumambient temperature being at 25° C) the circulation becomes gradually re-established, but only in those capillary vessels, which have, as in the preceding case, augmented their volume.

From the preceding facts, I cannot but conclude that the points of the tegumentary surface of the human body which are usually

exposed, as that of the face, the neck, the hands, &c., and consequently submitted to a mean temperature less than that of the body itself, have their capillary vessels of a larger volume than those of other portions of the skin.

ON THE EXISTENCE OF ARSENIC IN THE BONES OF MAN.

BY M. ORFILA.

He read an account of experiments on the arsenic contained in the body of man. The experiments were made in conjunction with M. Couerbe; they had for their object the solution of the following questions:—

1. Does arsenic exist in the normal state in the human body?—2. Do the viscera contain any?—3. Can we demonstrate the existence of it in the muscles?—Lastly, is it possible to establish that the arsenic obtained from a dead body is not that which existed in a normal state among the elements which compose the tissues, but has been introduced into the digestive organs, applied to the exterior, &c.

I. Arsenic exists in the bones of man: by calcining the bones of adults, taking care not to raise the temperature too much; by exposing to purified sulphuric acid the powder thus obtained, well dried and sifted; then by submitting the mixture to Marsh's apparatus; we shall obtain arsenical spots, brown, brilliant, and very thick.

This result has been obtained equally from bones taken out of the bodies of adults dead for several days, and from those inhumed several months.

Calcination to a white powder does not give arsenic. Neither is it obtained by operating on the bones of commerce reduced to a soft paste; but if they are submitted to heat at first, and to the processes which I have pointed out, (nitric acid, potash, sulphuric acid,) a certain quantity of arsenic is obtained.

From this first series of experiments, which are to the number of 14, I conclude, says M. Orfila,—1. That the bones of the adult man, of the horse, of the ox, of the sheep, contain small proportions of arsenic, which it is possible to establish by submitting the bones to alcoholized potash and sulphuric acid pure.

2. This quantity of arsenic does not increase by a prolonged inhumation.

3. Vitrification removes it in part; doubtless, by the volatilization which it causes.

4. As favourable conditions for the detection of arsenic, it is necessary to lay stress, first, on taking care not to calcine the bones too much; and, in the second place, on carefully avoiding the contact of the coal.

5. In submitting the bones to pure water, and to boiling, no arsenic is found.

6. If, in operating in this manner, arsenic is found, it may be affirmed that it has been introduced in one way or other into the economy.

II. Arsenic is not found in the viscera unless it has been absorbed by them. The organs of a dog, which had just been hanged, treated by the ordinary processes, gave none. The blood, the cerebral substance dried, the liver, the spleen, the kidneys, the intestines, the stomach, &c., offered no traces of it.

Carbonized with nitric acid, and subjected afterwards to Marsh's apparatus, they exhibited only white opaque spots, which were all produced as well without the presence of those organic substances.

The liver of an adult did not exhibit any thing more. Neither did decoctions made with various other organs.

Whence we must conclude, says M. Orfila, but not in an absolute manner, that the viscera do not contain arsenic in a normal state; but, in order to be more exact and to avoid prejudging, that they do not furnish any when treated by boiling water or hydrosulphuric acid, or carbonized by the aid of concentrated nitric acid, &c., it may have existed in so small a quantity, that the hydrosulphuric acid failed to detect it, or the carbonization may have caused it to be lost. Perhaps, by acting at once on a great number of brains, or other organs, we might find it. In all cases, it is sufficient for the moment to establish that the viscera do not yield arsenic by the tests indicated unless there has been a poisoning.

III. It is not proved that muscular flesh contains arsenic. Twelve pounds of muscular flesh taken from the body of an adult, treated by carbonized nitric acid, and then placed in Marsh's apparatus, exhibited white opaque spots, some shining, with a blue or rust-coloured reflection, others yellow, becoming dull on exposure to the air, having an arsenical appearance, dissolving in boiling nitric acid, not giving the smell of garlic when the residue was put on live coals, offering, in a word, none of the characteristics of arsenic. Moreover, these spots, which were very numerous, being exposed for nearly 20 days to a current of hydrosulphuric arsenic, gave no indication of arsenic. It is possible that they were a mixture of arsenic and animal matter; or, secondly, that the muscular flesh of two or three bodies united might yield some on analysis; lastly, that other processes might procure it from the same quantities by occasioning less loss. Accordingly I would not conclude in an absolute manner that

arsenic ought not to exist in muscular flesh.

IV. It is possible to establish that the arsenic which has been found does not come from the organized substance itself, but that it has been combined with it by absorption. For, if it is in the bones we find it, they must have been acted on for a long time, the action of boiling water will have had no effect, &c. If, on the contrary, the action of this last menstruum produced it, it might be affirmed that it did not already exist in totality. If it is found in organs in which up to the present time it has not been detected, in the blood, in the viscera before enumerated, the same conclusions will be established.

Lastly, if the muscles exhibit spots some of which so much resemble arsenic at first sight, the distinctive characteristics which we have enumerated must be remembered. Attention must be paid to their number, which is considerable, and, above all, to the results furnished by the action of different tests. If, lastly, the subject had undergone arsenical medical treatment for some time, our observation should be directed at once to the morbid phenomena which may have existed long before death, and to those which have immediately preceded, and seemed to produce it. We should carefully consult the anatomical state of the digestive organs; we should compare the symptoms with the lesions observed after death; and we must form our conclusion in all cases with extreme circumspection, particularly if we find in the digestive organs only a small quantity of poisonous substance, as in this case the poisoning might be confounded with the effect of the arsenical treatment.

I here terminate the account of the experiments, which I wished to communicate to the Academy, says M. Orfila. They have been undertaken more especially on the occasion of a criminal trial which is soon to come on in the Côte d'Or. I hope they may throw light on the arguments about to be opened. It is to that end that I have made them. I do not yet regard them as decisive and safe from objection; but I call for the objections, for I desire above all to bring truth to light; but I think that facts alone, and not theories, can with any foundation be opposed to the positive experiments, of which I have just communicated the principal results.

II. CHEMICAL MANUFACTURES.

ON THE DISCOVERY OF M. DAGUERRE.*

An important discovery has for some time occupied the attention of scientific men and artists. We speak of the invention of the Daguerréotype, of the photogenic processes, and the theories which have relation to the brilliant discovery of M. Daguerre. Independently of the precious results, of the immense resources which it offers to the arts of design, the daguerréotype touches on the physical and chemical sciences in so many points, that we cannot avoid entertaining our readers with it, although perhaps a little tardily.

Every one knows that the invention of M. Daguerre has for its object to fix the images produced by the Camera Obscura, and thus to create in some minutes, by the action of light, designs in which the objects preserve mathematically their forms even to the smallest details; in which the effects of linear perspective, and the gradual diminution of tone, attendant on aërial perspective, are exhibited with a delicacy hitherto unknown.

It is easy to see what resources, what perfectly novel facilities, this invention must offer for the study of the sciences; as to the arts, the services which it is capable of rendering are beyond calculation.

Without dwelling on the investigations which have had an analogous result for their object, and which at different periods have been, as it were, the prelude of M. Daguerre's discovery, we will rapidly describe the instrument and the processes, by the aid of which that skilful artist has resolved so important a problem.

A plate of copper, silvered over, is taken: this plate ought to be surrounded by a languet of the same metal, fixed by means of small nails. It is to be carefully freed from verdigris with nitric acid spread by water. A capsule filled with iodine, and covered with a metallic gauze, is placed at the bottom of a box. The metallic plate is put inside of this box, above the capsule, which contains the iodine, and the box is closed. At the end of a certain time the plate is found covered with a light layer of vapour of iodine, which gives it a tint of golden yellow. It is then withdrawn from the box and placed in the focus of a dark chamber. In some minutes only, the action is produced, although the image is still invisible on the pellicle of iodine. The plate is then withdrawn from the camera obscura, and put into a box, at

* From the *Journal de Pharmacie.*

the bottom of which is a capsule containing mercury, which is heated by means of a lamp placed under. The metallic plate ought to be placed here in such a position as to make an angle of 45° with the vertical line. If it were placed in an horizontal position, the image would not be seen, in its maximum of effect, by the eye of the spectator, without inclining the plate so as to make an angle of 45° with the visual ray. The mercury is heated to 60°. In looking then through an opening made in the side of the box, the plate is seen, accordingly as it is covered with mercurial vapours, to become overspread with traces, which soon will be the complete representation of the image formed in the focus of the dark chambers. The plate is withdrawn from the box, plunged into the hyposulphite of soda, washed with distilled water, and all is complete.

It will be seen that, by the discovery of M. Daguerre, physics have acquired a reagent remarkably sensible of luminous influence, a new instrument which, according to the expressions of M. Gay Lussac, will be, to the intensity of light and luminous phenomena, that which the microscope is for small objects, and which will certainly furnish the opportunity of new researches and new discoveries. Bass-reliefs, statues, monuments, in a word all dead nature, are represented with a perfection unapproachable by the common processes of design and painting; the perspective of landscape, of every object, is traced with mathematical certainty; no accident, no feature even unperceived by our eye, escapes the eye and pencil of the new painter; in fine, the industrial arts for the representation of forms, design for perfect models of perspective and different intensity of light and shade, the natural sciences for the study of species and their organization, will find immense resources in the application of this admirable discovery.

Science, as may easily be imagined, is eager to study all the circumstances of M. Daguerre's processes, and to seek, in the phenomena which result from them, some facts, or at least some considerations, by which physics and chemistry may profit. However unsatisfactory the explanations hitherto given of these phenomena may be, we will here say a few words on the different attempts which have been made on this subject.

We have seen, in the description of Daguerre's process, that the metallic plate was to be surrounded by a small languet, and that the capsule in which the iodine was exposed to spontaneous evaporation was covered with a metallic gauze. These two precautions have for their object the uniform distribution of the iodine on the surface of the plate; a light coat, of extreme thinness, which forms as it were the cover of the picture. The thickness of this yellow stratum of iodine, which according to M. Dumas, is not raised to more than *a millionth of a millimeter*, ought to be exactly the same throughout. The languet which surrounds the plate prevents more iodine from being deposited at the edge than in the middle; but a satisfactory explanation has not yet been found of the physical mode of action of this languet.

A circumstance no less mysterious is the necessity, in order to obtain the maximum of effect, either of inclining the plate to an angle of 45°, when it is submitted to the ascending current of the mercurial vapour, or of looking under the same inclination, if it has been placed horizontally, at the moment of the sublimation of the mercury.

As to the explanation of the chemical phenomena, the idea which at once presents itself to the mind is that the light, in the camera obscura, determines the vaporization of the iodine wherever it strikes the coat of gilding; that there the metal is denuded; that during the second operation, the mercurial vapour acts freely on these denuded parts, and there produces a white and dull amalgam of silver and mercury; that the washing with hyposulphite has for its end the removal of the portions of iodine which the light has not disengaged, artistically, the stripping of the shining parts which ought to be black. But, in this theory, what would those innumerable semi-tints be, so marvellously toned, which are exhibited in M. Daguerre's designs? A single fact proves also that things are not so simple; the plate of metal does not increase in weight perceptibly by being covered with the yellow layer of iodine. The increase on the contrary, is very perceptible under the action of the mercurial vapour. Well! M. Pelouze has convinced himself that after the washing in hyposulphite, the plate, notwithstanding the presence of a little amalgam on the surface, *weighs less than before commencing the operation*. The hyposulphite therefore carries away silver, and the chemical examination of the liquid shews that it is really so.

More recently, new observers have sought to give an account, by aid of a theory more or less ingenious, of the photometric phenomena produced by the daguerréotype.

Thus M. Donné has observed, that the coat of iodine adheres very tenaciously to the silver at the moment of withdrawing the plate exposed to the iodic vapour and before exposing it to the light; that then it resists the rubbing of the finger; but that after the action of the light, the adhesion of that coat is destroyed; so that the least friction is sufficient to detach it from the metal. M. Donné has thence concluded, that on the enlightened parts of the image, the layer of iodide of silver having no adhe-

sion to the plate, does not preserve the silver from the action of the mercury; accordingly we see plainly, after the operation, that metal condensed into small drops very perceptible under the microscope on the points struck by the light; while, in the shaded parts, the coat of iodide, always adhering, has not permitted the mercurial vapour to fix itself there. To sum up, the image produced by the process of the daguerréotype would be formed: the light parts by the mercury condensed into globules, and probably amalgamated with the silver; and the shadows by the mere burnishing of the silver, by the naked metallic substance, without any deposit of another substance. Indeed, when after the operation, all traces of the remaining iodide have been removed by the washing with the solution of hyposulphite of soda, the dark or shaded parts are naked and reflect the light, like polished or burnished bodies and glass, while the enlightened points are covered with a layer of a greyish white, easily removed, soiling the fingers, and in which the microscope shews a crowd of mercurial globules.

M. Golfier Besseyre thinks that the light acts on the iodide of silver-like heat; that this action has no other effect than to modify the molecular state, and to convert it into an isomerous body. The mercury in vapour which comes to the iodide of silver thus modified by the action of light, is condensed there and remains there in very brilliant globules, while the iodide of silver on which the light has not acted, yields iodine to the mercurial vapour which passes into the state of yellow iodide. The iodide of silver, modified or not by the light, would thus perform a function of reserve, either to receive and retain the mercury, or to turn aside the mercurial vapour by furnishing iodine to it, and the mercury must remain there only to form the light parts of the image.

Finally, M. Auguste Wallet has observed, by the microscope, the metallic plate after its exposure to the vapour of iodine, and thinks that he has seen a great number of little holes, of which the diameter varies from 0·03 to 0·08, observations on which he founds a new theory of photogenic phenomena.

Such are the different hypotheses which up to the present have been invented to account for the beautiful results of the discovery of M. Daguerre. Ulterior researches will doubtless cast a new light on these mysterious phenomena. In the mean time the discovery, happily, exists; and, as M. Arago has said, thousands of beautiful designs will probably be made with the daguerréotype, before its mode of action has been completely analyzed.

PREPARATION OF PRUSSIAN BLUE.*

BY MR. LEWIS THOMPSON.

In the usual mode of manufacturing Prussian blue, the requisite carbon and nitrogen are obtained by decomposing animal matter in contact with potash. In this process the potash, being reduced to the metallic state, causes the formation of cyanogen, in consequence of its affinity for that substance. The quantity of nitrogen furnished by a given weight of animal matter is not large, and, in the material employed by manufacturers, seldom perhaps exceeds eight per cent.; and of this small quantity at least one-half appears to be dissipated during the process, thus producing an enormous waste of material, and at the same time increasing the size of the apparatus. Reflecting on these circumstances, it occurred to me that the atmosphere might be made to supply, in a very economical manner, the requisite nitrogen, if allowed to act on a mixture of carbon and potash under favourable circumstances. The experiment proved on trial to be correct, and in some measure exceeded my expectation; for the carbonaceous matter employed may be worked over again many times, and is even improved by each operation. I found it necessary to use iron, for a reason which will be apparent in the explanation of this process; when iron is not employed, a much higher temperature is required.

To produce Prussian blue, the following method may be adopted, but experience alone can teach us the best proportions; and in this, as in most of the arts, the caprice of each manufacturer will probably lead to the adoption of various proportions of the ingredients used.

Take of potash or pearlash.... 2 parts;
coke, cinders, or coals . 2 parts;
iron turnings ..... 1 part.

Grind the whole together into a coarse powder, and place it in an open crucible or other convenient vessel, and expose the whole for half an hour in an open fire to a full red heat, stirring the mass occasionally. During the process, little jets of purple flame will be observed to arise from the surface of the mixture; when these have almost ceased to appear, which will happen about the time specified, the whole must be removed from the fire, and allowed to cool: water is now to be added, so as to dissolve the matter soluble in that fluid, and the black matter remaining put aside for another operation. The solution, after being filtered, is to be mixed with one part of copperas, and muriatic acid added in the usual

* From the *Transactions of the Society of Arts*, &c.

way to brighten the color of the precipitate. The quantity of Prussian blue produced from a given weight of pearlash or potash is generally about one-fourth of the weight of the pure potash contained in the salt; but the larger the quantity operated upon at one time, the larger is the relative produce. Thus six ounces of pearlash, containing 45 per cent. of alkali, yielded only 295 grains of Prussian blue, whilst one pound of the same pearlash yielded 1355 grains. The Prussian blue here spoken of is the pure perferrocyanate of iron.

In this process the potash is decomposed by the iron, producing potassium, which, being volatile, rises and combines with the carbon of the coke and with the nitrogen of the atmosphere, the oxygen of which has been removed by passing through the fire, or by the coke or cinders. In the mixture, the cyanide of potassium thus formed, is next dissolved in water, and furnishes ferrocyanate of iron on the addition of sulphate of iron and muriatic acid, according to the explanation given in most chemical books.

By deflagrating a mixture of nitrate of potash, coke, or small coals, and iron turnings, a mass is obtained which furnishes abundance of Prussian blue; but, in this case, the nitrogen is derived from the decomposition of the nitric acid of the nitrate of potash, for the experiment succeeds equally well in a close vessel. In these experiments, soda may be substituted for potash without affecting the result: the charcoal from most kinds of vegetables, cannot, however, be employed in place of that from coals, as it is very porous, and burns away too quickly. The presence of cyanide of sodium in barilla, kelp, and English alkali, is thus easily accounted for; and the small quantity of cyanide of potassium invariably produced during the process of preparing potassium, admits of a similar explanation.

ARTIFICIAL PREPARATION OF BROWN CASHOO.*

BY M. H. REINSCH.

For some time Cashoo has begun to be made use of in the tincture for the preparation of a very beautiful brown colour, fine and durable, which was formerly obtained by means of madder, and more slowly by the sulpho-arsenide of potash and of lead. The tincture by means of cashoo is prepared thus: it is dissolved in boiling water, with a certain quantity of sulphate of protoxide of manganese; cotton fibres, first operated on by acetate of lead as a mordant, are passed through lime-water, then plunged into a solution of bichromate of potash, and finally passed into the solution of cashoo. The success of stuffs dyed in this manner appears to have speedily exhausted all the cashoo which existed in store, so that the price of good brown cashoo was more than doubled. It is true, that besides this beautiful brown cashoo, another yellow cashoo is known in commerce, usually consisting of bits of the thickness of the thumb, of a cubic form, the price of which (in Germany) is little more than the third part of the present price of the former. Notwithstanding this difference, dyers have continued to reject the yellow kind, because the brown gives, in their opinion, a colour much richer, and, at least, double the colouring matter. But if the brown cashoo were prepared by means of the yellow, the remarkable difference in price could no longer exist. In all cases, it was necessary to seek that which gave a superiority to the brown cashoo over the yellow; and on this subject some indications of science appeared to establish that the brown colour was owing to a particular preparation of yellow cashoo, since the catechouic acid is transformed, by the action of air and heat, into japonic acid. However it may be, the preparation of brown cashoo from the yellow is very simple. The yellow cashoo is melted at a very moderate heat, and for every 100 kil. of matter, 1 kil. is added of bichromate of potash reduced to a fine powder, which probably yields oxygen to the cashoo; the melted cashoo is poured into wooden vessels, in which it forms, after cooling, a brown blackish mass, with a conchoidal fracture, which, in a humid atmosphere, becomes a little clammy, possesses an astringent taste, but which does not retain the sweetish aftertaste of the yellow cashoo. When the yellow cashoo is melted alone, a brown mass is obtained undistinguished from that prepared with bichromate of potash; which leads to the inference that the addition of that salt may be useless in preparing a good colouring matter. The brown cashoo of the East is therefore probably distinguished from the yellow only by a particular preparation. The best proof to make cashoo undergo will always be its degree of solubility in alcohol, in which it ought not to have an insoluble residue of more than $\frac{1}{12}$ of its weight. The mixture of bichromate of potash will always be easily recognized by the incineration and the solution of the ashes in nitric acid. As to the pharmaceutic uses, the preference should be given to yellow cashoo, because we are here to consider not the quantity of colouring matter sought, but the action of the tannin.

* From *Jour. für pract. Chemie*, xvii.

PRESERVATION OF BODIES FOR DISSECTION.*

BY DR. MARSHALL.

HAVING lately observed in the Medical Gazette an account of some experiments performed by Drs. Babington and Rees, with the view of preserving the human body for the purposes of dissection, a desideratum, which, if attainable, would be of no small moment, not only to the student of anatomy, but also to the practical anatomist; however, the last and best of the experiments described by these gentlemen, appears to be so much loaded with trouble and expence, as to prevent it ever becoming generally useful to either the one or the other.

Permit me, therefore, through your means, to offer to those who desire it, a much more simple, a far less expensive, and equally efficacious remedy for this purpose. When the body is first received into the dissecting-room it must be punctured over the whole surface with acupuncture needles, or the point of a narrow bistoury, scalpel, or scissors, the punctures being made pretty closely together, and deeply over the fleshy part; and, if for a dried arterial or venous preservation, the punctures ought to be made with very fine needles, and after injection; as, if done with bistoury or scissors, the wax, when exposed to heat, exudes from the punctures made in the vessels.

This being done, the body is brushed over with acetic acid — specific gravity 1·048, which must be brushed into it slowly and repeatedly, so that the acid may fully penetrate the innermost parts; a small incision may likewise be made in the thoracic and abdominal paries, through which a sufficiency of the acid, slightly mixed with water, may be poured.

Repeating the application of the acid to the surface of the body, for six or eight days, will not only preserve it free from putrefaction, but, at the same time, remove incipient greenness, and every species of odour, except the pungent, yet volatile odour of the acid, which, I should think, could be easily borne by the most fastidious student.

The only trials as yet made in the above way, have been, 1st, Catharine Diamond, courtesan, aged 26, cause of death not known, brought into the University dissecting-room on the 18th of May, three days after death, where, being Saturday night, the body lay till Monday morning, when it was placed in warm water for the purpose of arterial injection; after the body had become cold it was punctured with a pair of scissors, then brushed with the acid, as already mentioned; and by night the body (and during the day those parts not being dissected) was covered with damp cloths to prevent evaporation and consequent dryness: after three brushings, the abdominal muscles, which had become perfectly green, were restored to a fine natural colour; and the abdominal cavity, into which the diluted acid had been poured, though not opened for twenty-four days, was quite free from odour or the slightest appearance of putrefaction. The body remained on the table from the 18th of May till the 4th of July, fully exposed to the heat of a powerful sun in a room well lighted from the roof; and had it been necessary, by the same means it might have been preserved soft and beautiful throughout the warmest summer.

2d, John M'Caskle, labourer, aged 45, died 4th of November, in the Royal Infirmary, where the body had been inspected, received into the University dissecting-room on the 6th, where the body lay till the 16th, when the whole of the face, trunk, and upper extremities, became altogether green, and fast tending towards decomposition. On the 16th the discoloured parts were closely punctured with a pair of scissors, and three gills of acetic acid slowly brushed thereon; damp cloths were then placed upon the parts till the 18th, when the acid was again applied. On the 19th the remainder (altogether five gills) of the acid was used, and on the 20th the whole of the parts into which the acid had been brushed were perfectly restored to whiteness; and, indeed, the changed colour of the parts could be easily perceived after each application of the acid, more especially when the cloths were moistened with the acid, and closely applied to the parts.

The dissection of the body was commenced on the 20th November; and, on removing the skin of the face, neck, trunk, &c., small portions of the muscles of the trunk and upper extremities were a little green, but they were firm, and wholly free from odour, which last circumstance formed a broad contrast to the smell of the cranial cavity, where none of the acid had been used; the muscles of the face and neck having undergone less change, were entirely free from colour.

The punctures made in the skin, when large, give the body a somewhat odd appearance, but beyond this they are harmless, as the subjacent parts are thereby not at all injured for common anatomical pursuits; yet, if the cloths are wetted with equal parts of acid and water, and closely applied to the body, the finest long needles may be used; by this means the punctures are hardly perceptible, and two days' application in this way will beautify any subject.

The second subject was undergoing dissolution so rapidly that no student thought it worthy of dissection; however, on be-

* From the *Medical Gazette*.

holding the magical influence of the acid in restoring the natural colour and removing incipient putridity, the parts so improved were eagerly sought after.

For the above method of using the acid I am indebted to a pupil of my own, Mr. Daniel Wilson, of the Royal Navy, who, having formerly witnessed my many fruitless and expensive attempts to preserve the body, even for a short period of time, by injecting it with pyroligneous acid; and, moreover, having seen the antiseptic virtues of this acid fully and beneficially tested within the tropics, by preserving recently-killed animal food for an indefinite length of time, was induced to give it a trial, in the manner now described, and the trouble, as already mentioned, was very trifling; and the expense did not exceed, in the first instance, five shillings, in the second, little more than two, although buying the acid at the retail price.

By allowing the above to occupy a spare corner in your valuable journal, you will greatly oblige, sir,

Your obedient servant.

III. PHARMACY, &c.

CONSUMPTION AND TRADE OF OPIUM IN CHINA.

The sale of opium in the Chinese empire is forbidden by very severe laws; but the taste of the people prevails, and the avarice of the tradesman makes him brave the fines, the corporal punishments, and the conflagration of his shop and house, for the law condemns to the flames every house guilty of having this substance concealed. The demand for opium is about the same every year, and is regularly answered by the supply, in spite of the vigilance of the government agents. The Chinese take opium in different ways; they appear to give the preference to a mode of enjoying it, which is little or not at all known in Europe; they mix it with their tobacco, and the smoke of this mixture plunges them into a dangerous intoxication. The opium of Bengal is most in demand for smoking, on account of its perfume; but those who seek stronger impressions, followed by a more complete intoxication, chew the opium instead of smoking it, and they call for the opium of Malwa, which is most rich in morphine. It is for the same reason that this kind is generally preferred in the islands of Asia. It has even obtained such a preference in the market of Canton, that the opiums of Patna, Benares, Bengal, and Turkey, were threatened with a considerable fall, or even an entire exclusion.

The Chronicle of Singapore furnishes some curious details respecting the trade and consumption of opium in China. We take the year 1825, as offering a mean.

	In 1825,
3442 chests of the Patna and Benares, at the rate of 975 dollars, or 5362fr. 50c.	18,457,725fr.
6276 chests of the Malwa, at the rate of 705 dollars, or 3877fr. 50c.	24,218,865fr.
General Total..	42,675,590fr.

The Malwa, independently of the inferiority of its price, contains 14 per cent. of pure opium; while that of Patna and Benares contains only 9 per cent. This makes it more sought for. J. de F.

OPIUM SMOKING.—THE MEXICAN PLANTS.*

Dr. Sigmond gave a lecture on opium eating and its effects. After enumerating the various evils, both bodily and mental, which invariably overtake the habitual opium eater, he referred to the practice of smoking opium as carried on to a fearful extent by the Chinese. The way in which they conduct the process is as follows:—Having "purified" the opium by maceration in water, and dried it, they place it in the bulb of a pipe with a long tube. They lie on their backs on a couch, with the head elevated, and take in one whiff of the opium smoke, which, after retaining for a very short time in the lungs, they expire gently, and in such a manner that it comes out of the eyes and nostrils. The effect is immediate and very great. All the intoxicating influence of opium seems augmented, and some even fall victims to its excess. The injurious influence upon the constitution of the patient is in proportion to its intoxicating power; premature old age, nervous debility, mental and bodily imbecility, are the unfailing lot of the opium smoker. So fascinating is the influence of this noxious drug, that many would prefer death to exclusion from smoking it. The inhabitants of colder regions do not seem to be influenced by smoking opium to any thing like the extent that is observable in eastern countries.

Dr. Sigmond then alluded to the intro-

* Royal Medico-Botanical Society. Wednesday, Nov. 13, 1839.

duction of medicines into the system, by inhalation, and stated his determination of delivering some lectures before the Society on that subject.

Dr. Farre made some observations on a variety of plants which had been transmitted from Mexico; the only remarkable circumstance connected with which, was the great number of compositæ found in the Mexican flora.

After a few words from the chairman the Society adjourned.

NARCOTINE, A SUBSTITUTE FOR QUININE.*

Numerous experiments have of late been made in India with the view of ascertaining what substances of native growth could be substituted for the more expensive imported medicines. Of these, narcotine, as a substitute for quinine, has been submitted to extensive trials, and given the most satisfactory results. The narcotine was employed in the form of muriate, and administered in three-grain doses, and a number of cases are related where, from two to four doses of the narcotine succeeded in curing agues, which had resisted quinine, arsenic, *Cæsalpinia Bonducella*, and other native remedies.

Dr. Stewart of Calcutta, after enumerating a list of cures effected by this substance, thinks he is warranted in arriving at the following conclusions:

The muriate of narcotine is a perfectly safe agent to any extent, and in large or small doses, that, as a substitute for quinine, it is unexceptionable, and possesses over the latter many attributes which render it both a safer and more generally useful remedy in all the fevers of Bengal.

These are, 1. In small doses it proves antiperiodic, if given in the intermission some hours before the expected paroxysm.

2. In ten-grain doses it is powerfully and immediately calmant, sudorific, and antiperiodic.

3. It does not in such doses accelerate the pulse, nor exalt the sensibility of the nervous system; it does not interfere with the action of other medicines; it does not constipate; it never produces giddiness, headach, or disturbed viscera; it does not produce nor increase determination to any particular organ, or to any diseased or irritable viscus.

4. It promotes all the secretions, and seems to act equally and generally on the whole capillary system, without depressing the vital powers, which it rather sustains meanwhile.

5. Its action is maintained by application to blistered surfaces.

Dr. O'Shaughnessy observes, that the muriate of narcotine possesses powerful febrifuge and antiperiodic properties, but it does not produce narcotism, does not constipate the bowels, and never produces in fever cases the distressing head-ach and restlessness which so commonly follow the administration of quinine, and so often render its use uncertain, if not absolutely dangerous. The narcotine, is, moreover, proved to be a powerful sudorific, perhaps the only one with which we are acquainted, which acts without producing either nausea or excitement.

Dr. O'Shaughnessy prepares the muriate of narcotine by the following process, which appears to be simple and economical, and, so far as we are aware, new.

"Take of Bengal opium, 2 lbs. alcohol, 20 lbs. Rub them well together in a large mortar, adding the spirit by degrees, until the opium is exhausted of its soluble parts. Decant the solution, and press the insoluble part. To the alcoholic solution add as much ammonia as renders the liquid slightly turbid. Distil from a common alembic, till 15 lbs. of the alcohol are recovered. Draw off the fluid in a still, and set it aside to cool. On cooling, it deposits a mass of coloured crystals, composed of narcotine, meconate of ammonia, and resin. Wash with water, which dissolves the meconate of ammonia; and then with one quart of water and one drachm of muriatic acid, which dissolves the narcotine, and leaves the resin;—filter. The solution, which is of a rosy colour, is to be evaporated to dryness. The muriate of narcotine thus prepared is a transparent resinous mass, of a rosy colour, brittle vitreous texture, very soluble in distilled water and spirits, and intensely bitter.

A beautifully crystalline muriate of narcotine may be prepared by precipitating the muriate thus made by ammonia, and dissolving the precipitate in boiling alcohol, from which the narcotine separates in fine crystals, as the solution cools. The crystallized narcotine, placed in a tube, and subjected to the influence of a stream of muriatic acid gas combines with the acid, while it retains its original crystalline form. But this process, though more elegant, is too expensive and elaborate for general use, and the non-crystalline muriate is just as valuable as the more beautiful product now described.

* *Quarterly Journal of the Calcutta Medical and Physical Society*, July, 1838.

POISONING WITH ARSENIC.*

Louis Mercier, the father of several children, one of whom was of weak intellect, espoused a second wife, named Mary Chambelland. The latter was very frequently heard to express her disgust at being compelled to live under the same roof with the idiot boy, whose habits were extremely unclean and revolting. On one occasion the father was heard to say, in reply to some recriminations on the part of his wife, "Never mind, it will soon be over." On the 13th of December last, Mercier purchased an ounce of arsenic at an apothecary's shop. On the 15th, his son Nicholas was seized with vomiting. This continued for several days, and the boy expired on the 22nd. No medical aid was demanded; the child was attended by his father and stepmother alone: none of the matters vomited up were recovered.

At the trial of the father, which took place in November last, at the local assizes, the following documents were read by the Attorney General:

1. A report from the medical men who had been ordered to exhume the body fourteen days after death. They discovered acute inflammation, with ulceration in the intestinal canal, and concluded that the deceased Nicholas Mercier, had been destroyed by some irritant poison.

2. A report from MM. Séne, Pagen, and Fleurat, chemists, who had carefully examined the intestinal canal of Mercier without finding the least trace of any poisonous substance.

3. A medico-legal consultation from MM. Orfila, Devergie, and Ollivier, showing that the experiments of MM. Séne, &c., had not been pushed far enough, and requesting that the body might be sent to Paris for further examination.

4. A report from MM. Orfila, &c. showing that a certain quantity of arsenic had been extracted from the liver and members of Nicholas Mercier.

5. Two reports from MM. Orfila, Devergie, and Leseur; and from MM. Pagen, Séne, and Fleurat, showing that no arsenic was contained in the ground where the body of young Mercier had been buried.

After the reading of these reports, M. Orfila declared his opinion that Nicholas Mercier had died from poison, and in support of his opinion stated, at length, the following reasons:—

1. Up to January last, chemists were in the habit of merely examining the matter vomited, those found in the intestines, and the intestinal canal itself, if they discovered the presence of arsenic, and if the morbid appearances, &c., corresponded, then they concluded the case to be one of poisoning: on the contrary, if they did not find arsenic in the intestinal canal, they simply stated that no poisonous substance was discovered; and, sometimes, when the symptoms and morbid appearances were not in accordance with the idea of poisoning, they spoke very doubtingly of its occurrence or possibility. By the publication of M. Orfila's memoir on arsenic, it has been shown that arsenic may be found in the organic tissue, particularly in the liver of persons poisoned with that metal, even when no trace of it can be discovered in the digestive canal. M. Orfila's first experiments were confined to dogs, but he had soon opportunities of confirming his opinion by experiments on the human subject. Considerable quantities were found in the flesh and viscera of Soufflard, who poisoned himself with arsenic while on his trial for murder. M. Lorrin poisoned himself with arsenic, and numerous traces were found in his liver. Hence it is well established, that in case of poisoning with arsenic the metal is absorbed, and may be discovered in the tissues, while, by *the same processes*, not a particle of arsenic can be discovered in the same tissues if the person have not taken any arsenical preparation.

2. M. Orfila does not admit, with those physicians who examined the body of Mercier, that the symptoms and morbid appearances, taken together, are sufficient to prove that the deceased met with his death from poison; for it is a rule in medical jurisprudence, that such a conclusion should never be drawn unless the poison has been actually demonstrated by chemical means.

With respect to the report of MM. Séne, &c., and the non-discovery of arsenic in the intestinal canal, M. Orfila thinks that the latter named chemists are not to blame, because the method of experimentation which he (M. Orfila) adopts had not been published at the time of their report.

3. The experiments performed by MM. Orfila, Devergie, &c., demonstrated that the body of Mercier contained arsenic in addition to that which is naturally found in the human body. A certain quantity of the metal was obtained from the liver, limbs, and the putrid fluid of the barrel in which the body was forwarded to Paris. M. Orfila presented this metallic arsenic to the jury on a number of porcelain plates, and with it some arsenic extracted from the carcase of a dog poisoned with arsenious acid. It might, perhaps, be objected, that as the body of the deceased had lain for four months in the ground, some arsenic might have been generated by decomposition; to clear up this point two bodies were exhumed and analyzed, but not a trace of arsenic was discovered in them.

4. M. Orfila answered, by anticipation,

* From the *Journal des Debats.*

objections which might be offered to the preceding observations.—1. The tests might have contained arsenic;—they neither did, nor could they have contained a grain of this metal.—2. If the body contain naturally some arsenic, how can it be decided that that found in the body of Mercier was not part of the natural arsenic? In the normal state, when the liver is treated with nitric acid, it never furnishes arsenic, but the liver of Mercier did.—3. But, perhaps, the earth of the burying ground contained some arsenic, which may have passed into the body by imbibition. At four different times several pounds of the earth, which surrounded the body, were analysed, and on one occasion only was a very slight trace of arsenic discovered, and even here it was necessary to employ boiling sulphuric acid. Besides, bodies buried in grave-yards, which contain a much greater quantity of arsenic than that of *Villery-sur-Tisle*, do not contain arsenic.

From these considerations, M. Orfila concluded that Nicholas Mercier died from poisoning with arsenic.

M. Devergie having explained his reasons in a clear manner, expressed a similar opinion.

On the part of the defence, M. Raspail was brought forward to combat the opinions of MM. Orfila and Devergie. From the imperfect manner in which the remarks of M. Raspail are reported in the *Journal des Debats*, we find some difficulty in exactly seizing the objections which he put forward. M. Raspail affirmed, that if the chemists who first examined Mercier's body did not find any arsenic in the intestinal canal, it was because there really was no arsenic there. The examination of the earth surrounding the body, was imperfect. Instead of analysing a few pounds, the whole should have been analysed. The spots on the porcelain plate have, indeed, the appearance of arsenic, but nothing proves that they are. Several other substances will afford the same appearances. (Here the President interrupted M. Raspail to ask the name of such substances, but the latter refused to specify them.)

M. Orfila now refuted the objections of M. Raspail, one by one, and concluded by saying, that "if M. Raspail could name a single body, other than arsenic, in which were assembled the four properties mentioned in the report, he would instantly tear his report in pieces and abandon his opinion."

To this M. Raspail replied, that certain volatile oils, mixed with a phosphate, give a yellow precipitate, with the nitrate of silver, similar to that of arsenic. M. Orfila denied this. Besides, arsenic, when treated with nitric acid, gives a brick-red precipitate, and not a yellow one, as M. Raspail affirmed.

After this scientific encounter, MM. Orfila, Devergie, &c., were sent to examine, in presence of M. Raspail, the nature of the spots supposed to be arsenical on the porcelain plate. This was done at the laboratory of the Academy, and on the following day M. Raspail was compelled, although reluctantly, to acknowledge that the spots were arsenical. The father of Nicholas Mercier was, therefore, found guilty of having poisoned his son, and condemned to the galleys for twenty years.

POISONING BY THE EXTRACT OF ACONITE.*

Dr. Pereyra and his colleagues of the hospital at Bourdeaux have, for years past, been much in the habit of employing the alcoholic extract of the aconitum napellus, in the dose of from 3 to 10 grains during the 24 hours, in chronic rheumatism, neuralgia, certain forms of paralysis, &c. No accident had been known to result in their practice from its use, until about three months ago, when some fresh extract had been obtained from the *pharmacien:* of this, five grains had been given to three of the patients. One of these died at the expiry of three hours after taking it; and the other two became alarmingly ill. It would appear that, in about a quarter of an hour after the dose had been administered, they experienced the usual effects of the medicine—viz. tremors in the muscles of the thighs and arms, and a pricking starting sensation in various parts. But these symptoms did not cease, as they had usually done before, in a few minutes; they rather increased in force, so as to approach almost to convulsive movements. A sense of great irritation along the throat, followed by severe vomitings, now came on.

During the accession of the convulsions, the patients became quite unconscious; when these ceased, the speech was restored, but the sight was still confused, and a most intolerable scorching head-ach supervened. The surface was covered with a cold sweat, and the pulse was slow and irregular, but the respiration was short and hurried. On applying the ear over the region of the heart, it seemed that the impulse or stroke of its apex against the parietes of the thorax was often interrupted, while the ventricles still continued to expel their contents; for the pulse at the wrist not unfrequently beat thrice for one beat of the heart. Dr. Pereyra was struck with the marked resemblance of

* *La Française Lancette.*

the symptoms, in many respects, with those of Asiatic Cholera.

It was evident that the immediate cause of danger was *un défaut d'innervation* in the circulatory and respiratory systems; and therefore that the main object to be attempted was to stimulate their action through the medium of the nervous system. Heat and mustard poultices were applied to the extremities, the spine and precordial region was rubbed with tincture of cantharides, and ammonia in a strong decoction of *huaco* (a plant which had been used with advantage in several cases of cholera) was exhibited at short intervals. By continuing the use of these means for some time, all the unpleasant symptoms gradually abated, and finally ceased altogether.

ON THE EMPLOYMENT OF A NEW VEGETABLE, MONESIA, IN MEDICINE.*

BY DR. G. J. MARTIN ST. ANGE.

A vegetable substance, called *monesia*, has lately been imported from South America, in the form of hard thick cakes, weighing about five hundred grammes (9215 grains). These cakes are composed of the extract, prepared in the country, from the bark of a tree whose botanical name is not known. M. Bernard Derosne, the druggist who introduced it, informs me that some travellers call the monesia bark *goharem*, and others *buranhem*. The naturalists who have examined this think that the tree which furnishes it is a chrysophyllum.

The extract is of a deep brown, and very friable; when broken it looks like a well-roasted cacao nut. It is entirely soluble in water, and its taste, which is at first sugary like liquorice, soon becomes astringent, and leaves behind a well-marked and lasting acid taste, which is particularly felt at the tonsils.

The bark of the monesia is smooth and greyish, like that of the plane-tree, with this difference, that it is much thicker, that its fracture is imbricated, and that its sweet taste forms a strong contrast with the bitterness of the thin laminæ which are detached from the plane.

Chemical analysis of the bark of the monesia, and of the imported extract, according to MM. Bernard Derosne and O'Henry, has demonstrated the presence of the following soluble principles: — 1. Chlorophylle; 2. vegetable wax; 3. a fatty and crystallizable matter; 4. glycyrrhizine; 5. an acrid and somewhat bitter substance; 6. a little tannin; 7. an unexamined organic acid; 8. a red colouring matter, resembling that of cinchona; 9. phosphates of lime, with organic acids.

The pharmaceutical preparations which have been made with this substance are — 1. an aqueous extract; 2. a syrup, containing thirty centigrammes (5½ grains) in the ounce; 3. a hydro-alcoholic tincture, containing two grammes (37 grains) per ounce; 4. chocolate, containing thirty centigrammes (5½ grains) in each cake weighing three decagrammes (7 drachms, 49 grains); 5. an ointment, containing an eighth part of its weight of extract; 6. monesine, being the acrid substance mentioned in the analysis.

The extract contains about eight per cent. of glycyrrhizine, and twenty per cent. of acrid matter.

The following accounts of monesia are already in existence:—1. A manuscript memoir, which is in the hands of the commissioners appointed by the Academy of Medicine. 2. A synoptical table, giving the analysis, some pharmaceutical preparations, and the medicinal preparations of monesia. 3. A very minute summary of these two papers, entitled, "Account of Monesia." 4. An article inserted in the *Bulletin Therapeutique*.

I will now give a succinct account of the facts which have been published, before mentioning the results which I have obtained myself.

The medical cases in the synoptic table have been drawn up by several physicians in Paris; they give the nature of the disease, the sex, the profession, the age and the constitution of the patient; the mode of treatment, the duration of the disease, the termination; and, lastly, the remarks suggested by each method of treatment.

M. Alquié, professor of pathology at the Val-de-Grâce, found—

1. That of forty-two soldiers attacked with diarrhœa of different degrees of severity, thirty-six were cured in twelve days; twenty-four by the extract of monesia given in pills, in the dose of from eighty centigrammes to a gramme (14½ to 18½ grains) a day; and twelve by the tincture, administered as a clyster, in the dose of eight grammes (147½ grains) in two hundred and fifty grammes (4607½ grains) of bran water.

2. That in two cases of menorrhagia, the extract and the tincture of monesia given internally soon calmed the pain, and stopped the uterine discharge.

3. That in four women attacked with profuse leucorrhea, the extract of monesia given internally, and the diluted tincture injected into the vagina, were beneficial.

4. That in two cases of hæmoptysis, where bleeding, ligature of the limbs, and ordinary astringents, had been employed without advantage, the extract of monesia succeeded completely; and that several

* *Gazette Médicale.*

chronic cases of bronchorrhœa were benefitted by the syrup of monesia, which was sometimes combined with opium.

M. Baron cites — 1. A very remarkable case of chronic inflammation of the vagina, of a syphilitic kind. No advantage had attended the previous use of baths, local bleedings, emollient and astringent injections, the nitrate of silver; a year later the diluted supernitrate of mercury, sulphurous baths, leeches, and the repeated application of blisters and sinapisms, were equally useless. In spite of these remedies the discharge from the vagina became more abundant. Injections were then used containing thirty grammes (552 grains and 9-10ths) of the extract of monesia in a hundred and fifty grammes (2764½ grains) of water. In eight days the discharge was much diminished, and in three weeks the patient was cured. The discharge returned in a month, but again yielded to the same injections.

2. A case of leucorrhœa. The discharge was copious, of a yellowish white colour, and accompanied with pains in the groins and lumbar regions; baths, leeches, and injection of mallow water and laudanum, had produced no benefit. Injections of monesia, in the proportion of thirty grammes (552 grains and 9-10ths) to a hundred grammes (3317½ grains) of water, were employed once a day, and the patient was cured in a fortnight.

3. Several cases of diarrhœa, which resisted the means generally used, were cured by the extract of monesia given internally, and clysters containing the tincture, in different proportions.

M. Buchez has employed the extract of monesia, and he has remarked, that it delayed the progress of caries in the teeth, and that, when combined with opium, it often soothed the pain more effectually than the opium alone. He recommends the employment of the tincture to keep the gums in a healthy state.

M. Daynac speaks of the good effects he has obtained from the preparations of monesia (the syrup, lozenges, and paste) in several cases of the chronic catarrh of the old, in dyspeptic persons, and in the third stage of phthisis. He also cites remarkable cases of scrofulous engorgement, much benefited by the use of the tincture of monesia, in the dose of eight grammes (147½ grains) daily, continued for a greater or less time. Lastly, the extract of monesia in pills, in the dose of from sixty to ninety centigrammes (11 to 16½ grains), has been very serviceable in uterine discharges.

M. Laurand speaks of a well-marked case of scurvy which he cured with monesia. The patient had had frequent epistaxis, which had several times required the nostrils to be plugged. He was made to inspire acidulated water by the nostrils, containing thirty grammes (552 grains and 9-10ths) of the tincture to a pound of water. This stopped the hæmorrhage; but when the same thing had been done with acidulated water not containing monesia, it had not succeeded. The patient also took from a gramme to a gramme and a half (18½ to 27½ grains) internally every day. The same physician has ascertained the efficacy of monesia in a great variety of circumstances, particularly in gangrenous eschars on the sacrum.

M. Manec has employed the different preparations of monesia with success:—1. In a man who, for six years, had had a large serpiginous ulcer in the bend of the groin, which had resisted every kind of treatment, and which rapidly improved under the use of monesia ointment.

2. In a great number of aged women labouring under diarrhœa, and in persons affected with chronic bronchitis.

M. Monod has furnished some very interesting cases; some of ulcers of the nose, and others of affections of the intestinal canal. The ulcers were dressed with the powdered extract, and cured in a few days. In other cases the extract given in pills to the amount of from 60 to 120 centigrammes (11 to 22 grains) daily, was perfectly successful.

M. Payen, who has employed monesia in a great number of cases, has seen a patient in whom leucorrhœa was considerably increased by this medicine, administered two different times; the monesia was then tried as an injection, and the discharge, which had hitherto resisted every remedy, disappeared, and did not return. The same practitioner cites two cases of uterine hæmorrhage, where the patients were obliged to keep their bed for a fortnight at each menstrual period, and in which the monesia brought back the discharge to its healthy standard. Lastly, M. Payen has succeeded in cicatrizing an ulcer in the lower jaw, which, for ten months, had resisted every kind of treatment, both internal and external; and in healing ulcerated chilblains, by means of the ointment and the powdered extract of monesia.

Thus we see that monesia has been employed both externally and internally. It has been frequently administered during the chronic stage of bronchitis, usually alone, but sometimes combined with opium, and in the greatest number of cases it has seemed to act advantageously upon the disease, the expectoration and respiration being rendered more easy.

In many cases where pulmonary hæmorrhage was prolonged, having resisted various and generally efficacious remedies, the

extract of monesia has stopped the spitting of blood.

In weakness of the stomach monesia has a very favourable influence on digestion, and secondarily on nutrition. This medicine has also been very beneficial in chronic enteritis; it has chiefly succeeded against diarrhœa, from whatever cause it arose.

The efficacy of monesia taken internally has been less marked in leucorrhœa than in diarrhœa; yet it has been useful in the majority of patients who have taken it; but injections have been more advantageous.

In every case of uterine hæmorrhage where monesia has been given, it has succeeded in moderating and suppressing the discharge more readily than the other remedies which had been previously used.

Monesia has also been of great advantage in scorbutic and scrofulous affections, and has always benefited ulcers of a bad character, whether the ointment, or the pure extract powdered, or the acrid substance contained in it, has been employed.

Such is the compendium of the cases hitherto published, with the exception of four by M. Forget, which are the basis of the article that he has published in the *Bulletin Thérapeutique*, and which, as he says himself, neither tell for nor against monesia.

We may say, therefore, generally, that monesia shews its maximum of power in diseases of the digestive organs, in hæmoptysis, uterine hæmorrhage, and ulcers of the skin, or of the mucous membranes, at their origin. A remarkable point in this remedy is, that although it is gifted with energetic powers, and has acted upon the tonsils or upon ulcerations as an active stimulant, it has never irritated the stomach as tonics (?) properly so called, often do. In order to form a due estimate of its relative activity, we must not forget that it has always been employed after the exhibition of other remedies.

I now come to my own cases, the general results of which may be stated as follows:—

Monesia, when exhibited internally, in the dose of from 75 to 125 centigrammes (14 to 23 grains) of the extract daily, for eight or ten days, whether in the form of pill, tincture, or syrup, has an immediate effect upon the digestive passages, and quickens the action of the stomach in a very remarkable manner. If the dose of the remedy is pushed to four grammes (74 grains) of the extract daily, for fifteen or twenty days, the appetite increases, but the patients sometimes experience a feeling of heat in the epigastrium: tenesmus and obstinate constipation may also come on; hence its action upon the digestive tube should be moderated by diminishing the dose according to the effect produced, and administering emollient or laxative clysters, as may be required.

Monesia ointment may be employed externally upon sores, in every case, but with more or less success, according to circumstances: thus I have seen it succeed in large and excessively painful ulcers, arising from the action of blisters, in sores produced by burns, in varicose ulcers and old wounds; in a word, whenever the sore is painful, and depends on a merely local affection. When this is not the case, and the ulcer is kept up by syphilis, scrofula, scurvy, or cancer, it is impossible to effect a permanent cure by merely applying the monesia ointment, washing the sores with the tincture, or sprinkling them with the extract or acrid principle contained in it. Yet, by employing these different preparations in a proper manner, we may hope to modify the sores, and even to cure them for a time. Generally speaking, the ointment, when applied to a sore, calms the local pain; the tincture thus used, produces a sensation of heat, which ceases immediately; the powdered extract more or less excites the sore, and the acrid principle in powder, when well prepared, has a special activity greater than caustic: hence it is a powerful remedy against fungous or atonic ulcers of a bad appearance; but as soon as these sores become painful, and especially when they are covered with a whitish pellicle, the use of the acrid principle should be discontinued; for it is usually this pellicle which, by preserving the surface of the sore from contact with the air, and perhaps by becoming partly organized, produces cicatrization.

I have said expressly, that it is impossible to obtain a lasting cure of syphilitic or cancerous sores by the mere external use of this remedy; in such cases, therefore, we must have recourse to a specific treatment capable of acting on the system. I have found that in order to effect the cure of scrofulous ulcers, the monesia must be employed internally, for five-and-twenty or forty days, and even longer, according to the case; and this in large doses, such as four or five grammes (74 or 92 grains) of the extract daily, in the form of a pill, tincture, or syrup. In this way I have succeeded in curing or benefiting several scrofulous patients. The following are two remarkable examples:—

Case I.—A young man, of 17, a printer, born of very healthy parents, came to see me in February, 1839, to have the little-finger of his left hand amputated. On looking at the diseased parts, I saw it was a scrofulous affection of only eight

months' standing. The first phalanx was much swelled, the soft parts covering it were livid, and there were three fistulous openings in the skin; two corresponding to the dorsal part of the phalanx, and the third to its palmar surface. They were surrounded with callous vegetations of a brownish colour, and communicated with one another by means of subcutaneous fistulous passages. By introducing a blunt probe into the sores, it was easy to reach the bone of the finger, and to ascertain the detachment of the skin and the caries of a portion of the phalanx. The suppuration was serous, yellowish, of a faint odour, and contained some flakes of a substance which seemed carious. Strong pressure of the diseased tissues occasioned hardly any pain. On the back of the hand and the left elbow there was also a swelling of the skin and of the subjacent parts, looking like the little-finger. The swelling and livid patch extended from the elbow to the inside of the bend of the arm; its centre was ulcerated, and covered with a thick crust, which, according to the patient's report, was renewed every two or three days.

I began by sprinkling the acrid principle of monesia on the small sores of the finger. After some days' dressing, the swelling of the soft parts began to diminish, and at the end of about twenty days the fistulous openings entirely closed. The diseased tissues at the back of the hand then ulcerated, and the acrid principle being employed as above-mentioned, in a few days a cure was effected. There remained only the sore upon the elbow, which had been purposely dressed with cerate. It continued to suppurate, and to be covered from time to time with a fresh crust.

The patient was in this state when I presented him to Dr. Bailly, who had been commissioned by the Academy to report on the effects of monesia. The affection appeared to him to be evidently scrofulous, and the result obtained to be very satisfactory. The disease, however, soon reappeared; the fistula of the finger began to suppurate again; there was swelling and livid redness of the soft parts, with engorgement and induration of the back of the hand; the sore on the elbow became larger and deeper. The patient now entered the hospital of St. Louis, where he had internal medicines as well as fumigations, sulphurous baths, &c. In a month he came out, with the diseased parts in a worse state than ever. I now prescribed the internal use of monesia—namely, twelve pills, each containing twenty centigrammes (3¼ grains), and two spoonfuls of tincture. The sores were dressed with common cerate. Under this treatment the patient was cured in thirty-five days. Nevertheless, he continued to take five pills a-day till the fiftieth day.

Since July, the diseased parts have been constantly improving, and a lasting cure may be hoped for. It is right to state, that in this case the preparations of monesia did not cause tenesmus or constipation, although the patient did not employ any purgative; the only thing he complained of was too much appetite.

Case II.—M. —, æt. 40, who had always enjoyed perfect health, came to France two years ago, and perceived, in the month of April, 1839, that he had an indolent tumor in the left inguinal region. Several physicians of the capital were consulted, and they ascertained that it was a swelling of one of the superficial lymphatic glands, situated in the bend of the groin. On the 21st of the same month, I was also consulted by the patient. The diagnosis was not difficult, but the point was to know how the tumor would turn out. My prognosis was favourable, like that of all the other physicians, excepting M. Lisfranc, who thought that the swelling of the gland, though slight, depended on a general affection. On the 2d of May the groin continued to swell, and from that time all the other glands of that part, as well as of the left iliac fossa, swelled considerably; and this was soon the case with those of the opposite side. Twenty pages would scarcely suffice to tell all that was prescribed by the physicians, and patiently submitted to by M. ——. No remedy was of any use, except for a short time; and I therefore proposed monesia, in the dose of 150 centigrammes (28 grains) of the extract a day. The patient at this time was extremely weak, ate but little, and was feverish every day. In a week, digestion had improved; there was a sensible increase of strength, and no fever. The sores were dressed with the monesia ointment. In consequence of these results, I tried to augment the dose of the medicine, and, besides the extract, the patient took two spoonfuls of the tincture, and from four to six of syrup in an infusion of hops. As to the sores, which obviously grew better, the same dressing was continued morning and evening, and every thing promised a speedy cure, when constipation and a most painful tenesmus came on, which obliged us to suspend the treatment. In a few days the sores became larger and larger, fungous, and of a bad appearance.

The dressing was then changed—extract of monesia in powder and the tincture being employed; but these remedies were almost as useless as a host of others which were successively tried. It then seemed clear to me that the internal use of monesia had alone produced the improvement, and

its use was accordingly resumed, taking care to make laxatives a part of the treatment. For this purpose the patient had two glasses of Enghien water every morning, and an emollient clyster. In a fortnight, the good effects of the monesia were again perceived; and this was the more to be attributed to its internal use, as the dressing had been performed with simple cerate.

At present, the swelled glands of the groin are softening and disappearing, without any suppuration. Those of the iliac fossa are diminishing in size; the sores have cicatrized, and the disease, far from attacking the lymphatic glands of the other parts of the body, as is commonly the case, is localized, and is much lessened. The patient eats with a good appetite, sleeps well, and takes exercise three hours a day, which makes us hope for a fortunate termination of the disease.

Another result which I have obtained from the use of monesia, and which has been observed by other practitioners likewise, is its action upon the uterus in cases of metorrhagia. I will give two instances:—

Case III.—Madame ——, of a plethoric constitution, was attacked, after the catamenial period, with a flooding, which obliged her to keep her bed and seek for advice. After having employed cold drinks, ligatures on the limbs, cupping-glasses, and other revulsives, without success, I made the patient take five monesia pills, each containing 20 centigrammes (3 grains and 3-5ths). The next morning she was very weak; the skin burning, the pulse scarcely perceptible, the face pale, and the eyes sunken. She had shivering fits from time to time, a sensation of weight in the loins, transient colic pains, and headach, with sleepiness; and what was more, the hæmorrhage did not diminish. I then prescribed twelve pills of extract of monesia to be taken every hour. The discharge stopped the same day, and never returned.

Case IV.—Madame ——, aged 20, who had been married six months, had frequent pains in the loins; and in a few days a flooding came on, which obliged her to keep her bed. The hæmorrhage increased, as soon as the patient got up; there was no pain in the abdomen, and no constipation; the pulse was weak and irregular, and from 76 to 80 in a minute. Revulsives, cold and acidulated drinks, clysters of cold water, and compresses dipped in iced water and applied to the thighs, had no effect. The ergot of rye was then employed, but as this excited vomiting, it was discontinued, and pills of the extract of monesia were ordered to be taken every hour, until an effect was produced. After fourteen pills the hæmorrhage ceased. The patient then took cold broth at intervals, and in spite of the lightness of this food, the discharge returned in the evening with violence, and again ceased after the exhibition of ten monesia pills.

On the following day, the dose of the medicine was diminished to 75 centigrammes (14 grains), and in six days the patient was quite well.

Quite lately, I employed the acrid principle in powder, in the dose of 15 centigrammes (2 grains and 7-10ths), taken in a prune; it was to stop a uterine hæmorrhage, which had suddenly come on during the night; the discharge ceased the same day. But as this case stands alone, additional facts are necessary to prove the power of the acrid principle under such circumstances. In every case, monesia acts in a remarkable manner upon the uterus, when it is not in its natural state. This new medicine may be used in different ways, and it acts on different organs, particularly when they require to be strengthened without too much excitement.

This is confirmed by the following passage from M. Buchez:—

"I have tried the extract of monesia," says this skilful practitioner, "in different affections of the mouth, particularly in inflammation of the gums, and uniformly with advantage. Its application produced a good effect, by almost instantaneously soothing the pain, which often accompanies inflammation. This mode of treatment I have found very successful in the scorbutic swelling of diseased gums, and it has removed affections which had previously resisted other remedies. When caries of the teeth is attended with pain, the application of monesia is sure to remove it in a few moments."

When all the ascertained facts are compared together, one is struck by the very peculiar tonic action of monesia on every organ. As its powers have been tried in more than four hundred cases, we may be allowed to consider monesia as a very useful remedy, under several circumstances, particularly scrofulous affections and uterine hæmorrhage. Hence the art of healing has made a real acquisition; nor is it to be imagined that this tonic has any identity of effect with those already known: quite lately a tannin ointment, and monesia ointment were tried and compared with each other, and the advantage was on the side of the latter. Moreover, it is clear that every medicine acts in its own way, and that there cannot be two whose special effects are the same. Well-informed practitioners know that one purgative cannot be indifferently substituted for another; and that every narcotic has not, in the same degree, the power of soothing and producing sleep; that the action of the various tonics is also very dif-

ferent; and that the general effects of medicines are like the difference of faces; many resemble each other at the first glance, but none can sustain an exact comparison.

NEW TEST FOR THE DETECTION OF PREGNANCY.*

M. Nauche found that the urine of pregnant women contains a particular substance, which, when the urine is allowed to stand, separates and forms a pellicle on the surface. M. Eguiser, from an extensive series of observations, has confirmed this fact, and found that the *kisteine*, as this particular substance has been called, is constantly formed on the surface of the urine of women in a state of pregnancy.

The urine must be allowed to stand for from two to six days, when minute opaque bodies are observed to rise from the bottom to the surface of the fluid, where they gradually agglomerate, and form a continuous layer over the surface. This layer is so consistent that it may be almost lifted off by raising it by one of its edges. This is the kisteine. It is whitish, opalescent, slightly granular, and can be compared to nothing better than to the fatty substance which swims on the surface of soups, after they have been allowed to cool. When examined by the microscope it has the aspect of a gelatinous mass, without determinate form; sometimes cubical shaped crystals are discovered on it, but this appearance is only observed when it has stood for a long time, and are to be regarded as foreign to it. The kisteine remains on the surface for several days; the urine then becomes turbid, and small opaque masses become detached from the kisteine, and fall to the bottom of the fluid; and the pellicle soon becomes destroyed.

The essential character of the urine of pregnancy, then, is the presence of kisteine; and the characters of the pellicle are so peculiar, that it is impossible to mistake it for anything else. A pellicle sometimes forms on the surface of the urine of patients labouring under phthisis, abscess, or catarrh of the bladder, but may be easily distinguished by this circumstance, that it does not form in such a short time as the kisteine, and that, in place of disappearing, as this last, in a few days, it increases in thickness, and at last is converted into a mass of mouldiness. There exists, likewise, a very marked difference between its mucous aspect and that of kisteine—a difference which it is difficult to describe, but which is easily recognized.

Kisteine appears to exist in the urine from the first month of pregnancy till delivery. M. Rousseau has even recognized it in the urine of a few gravid animals.

* *L'Experience*, July 25, 1839.

NEW SIGN OF DEATH BY HANGING.*

M. Duvergie proposes two additional tests, which he thinks will be of much service to the medical jurist in cases where exists any dubiety as to whether a body found hanged has been so during life or after death. He has found in all cases of death by hanging "congestion of blood in the organs by which the generative act is accomplished," and "the existence of spermatic animalculæ in the urethral canal." The first of these has been frequently remarked before; but the last merits notice. He has been able to detect, with the aid of the microscope, spermatic animalculæ both in the semen which has been ejected upon the linen of the deceased, and also in the portions of that fluid still remaining within the canal of the urethra. He has even detected these animalculæ in seminal stains which had been on linen for no less a period than six months; but in this last case many of the animalculæ were found to have lost their tails, in consequence of the manipulations preparatory to their being subjected to the powers of the microscope.

He suggests the examination of spermatic stains by the microscope as a test of far greater value than any which chemistry is able to furnish. He advises that the fluid be pressed out from the urethra in preference to laying that canal open, as in this way the fallacy which might arise from the intermixture of any portions of blood is avoided. The fluid expressed is placed between two plates of glass and subjected to the microscope, when the spermatic animalculæ, if present, may at once be detected.

[Plenty of this TEST, *if it be a test*, was taken from dead bodies (*not hanged*) by Dr. John Davy. See a long paper in his RESEARCHES, vol. ii.]

POISONING OF RABBITS PRODUCED BY THE SULPHATE OF QUININE, ADMINISTERED IN A FULL DOSE.

BY M. DESIDERIO.

This memoir contains the result of nine experiments made on rabbits. In the first two, 40 grains produced death in less than five hours.

* *Annales d'Hygiene Publique*, January 1839.

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THE CHEMIST.

I. CHEMISTRY.

NOTICE ON THE GALVANIC TELEGRAPH OF M. STEINHEIL.

The telegraph of M. Steinheil is an application of the successive and fundamental discoveries of Œrsted and Faraday, and of the multiplier of Schweiger. In a copper wire 36,000 feet long and three-fourths of a line thick, united at the extremities, M. Steinheil produces a galvanic current by the action of a rotatory machine similar to that of Clarke, but so constructed that the resistance, in the generating apparatus, may be very great in relation to that which takes place in the *conductor*, as the copper wire is called. This conductor forms, on different stations, multipliers of 400 to 600 revolutions in isolated copper wire, very fine, about a magnetized needle placed on a vertical axis terminated by two points.

The deviations produced by the galvanic current on these magnetized needles take place instantaneously; they give the means of obtaining telegraphic signals. It is perceived that there are only two different signs produced, the one when the current is directed in one way, and the other resulting from the direction of the current in the opposite way. The current is directed at will by turning the revolving machine in one direction or the other. The magnetized needles, after their analogous deviations, are brought back to their primitive position by the action of the magnetic forces of two small regulating magnets. At each station there is a rotatory apparatus which produces the force causing the deviations, and another which gives the signs according as the deviations are produced.

Wherever the conductor passes, a force is possessed acting instantaneously, according to the will of him who produces it. No more is wanting to communicate ideas; it is sufficient to make a judicious choice of the signs by means of which they are to be represented.

A telegraph, of which the signs are only visible, can never be perfect, because it exacts a continual attention on the part of the observers. In order to make his telegraph exempt from that objection, M. Steinheil has endeavoured to produce sounds which, striking the hearing, may produce a telegraphic language which shall be an imitation of words. To attain that end, M. Steinheil places beside the two magnetized needles two little bells, each giving a sound peculiar to itself, and easily distinguishable from that of the other. Each deviation of a needle occasions, on the part of the latter, a shock against the corresponding bell, and as the deviation of either of the two needles is produced at will by directing the galvanic current either way, the desired sound is instantly obtained.

M. Steinheil is not confined, in the arrangement of his telegraph, to the production of fugitive sounds; he wished also to fix these sounds by tracing on paper signs to report them. He has succeeded by making to come forward, by means of the deviation of the two magnetized needles, two little pointed tubes armed with a peculiar ink. At each stroke of the bell, one of the points is seen to advance against a narrow strip of paper which moves very slowly with a uniform speed before these points, and to make on the paper a very distinct mark, representing the musical note which the bell has sounded. The points or notes left by each point are on the same line. There are therefore two lines of notes.

By combining the sounds and the notes up to four, M. Steinheil has obtained a spoken alphabet and a written alphabet comprising the letters necessary to write all the words of the German language, and also the figures. In a design which will be submitted to the view of the Academy may be seen the arrangement of the points in order to form the signs by means of which it represents both the letters and the figures.

The sounds may be produced in a very short time; it is easy to obtain four in a

second. Greater intervals separate the letters and the words. By habit the observer comes to comprehend the music produced by the playing of the telegraph, and to read the signs which result from the arrangement of the notes left on the continuous slip of paper.

The memory is aided by a certain analogy which M. Steinheil has sought to establish between the form of the letters and the figure resulting from uniting the notes by right lines.

M. Steinheil thinks therefore that he has invented the first telegraph, in the true sense of the word, that is, an apparatus speaking a language easy to comprehend, and which itself writes what it says, or rather what it is made to say.

The apparatus is simple and solid. For more than a year that it was constructed (July 19, 1838) it had not yet required any repair.

A fact worthy of remark, and which may be observed in the conductor employed by M. Steinheil, is that the conductor has not experienced any oxydation; the galvanization has kept it from it, notwithstanding its exposure to the air for a great length of time.

The galvanic telegraph, established at Munich, sets out from the observatory of M. Steinheil at the Lerchenstrass. At that point the conductor is united to a plate of copper put in the ground. Setting out from thence the copper wire traverses, in the air and above the houses, the part of the city comprised between the Lerchenstrass and the buildings of the Academy of Sciences, where a second station has been established.

From the Academy, the conductor proceeds to the Royal Observatory, at Bogenhausen, the third station, after having crossed, in the air and above the towers and high buildings, the remainder of the city, then the Issar (a river which bounds it on one side), then the mountain called Gasteig, and, finally, the town of Haidhausen, which is a kind of suburb of Munich. The distance is about a league and three quarters German.

At the Royal Observatory, at Bogenhausen, the wire ends, as at the point of departure in a plate of copper buried in the ground.

Although the earth is but little endued with the conducting faculty in comparison with that of metals, the galvanic current traverses the distance of which mention has just been made, with a resistance so much the less as the surface of the buried plates is enlarged. Those which are applied to the two extremities of the conductor, at the Lerchenstrass and at Bogenhausen have their side only six inches.

It is seen, therefore, that the same means may be applied for very considerable distances. Numerical measures of resistance for different compositions of ground, leave to M. Steinheil the certainty that the application of this discovery will not be limited either by distance or by the nature of the soil.

Since the construction of his first galvanic telegraph, M. Steinheil has imagined new means of simplifying the solution of the problem which he has proposed to himself. He has found, for example, that the earth may serve as half the conductor: a discovery which would be of the greatest importance, if, as he doubts not, his anticipations be realised.

M. Steinheil announces that he has determined, by observation, the law according to which galvanic forces are dispersed in passing through the earth, or by waters of great extent. This work, from which the author expects marvellous results, will be published immediately.

NOTE ON THE PROPERTY OF REMOVING VERDIGRIS, POSSESSED BY A DOUBLE CHLORIDE OF ZINC AND AMMONIA.

BY M. GOLFIER-BESSEYRE.

There exists a double chloride formed, equivalent to equivalent, of chloride of zinc and of sal ammoniac, crystallizing very easily, sometimes in tables and sometimes in prisms, according to the state of dilution or the acidity of the medium; but always forming rectangular parallelograms of which the solid angles are often truncated so as to present hexagons very often slanting, susceptible of increasing in every direction, and of forming hexahedric prisms, &c.; in fine, there is a great tendency to crystallization.

It is very soluble; water takes up more than 1½ times its weight of it at the ordinary temperature, and 3½ times its weight when boiling.

The solution is rapidly effected, producing a great diminution of temperature.

Heat decomposes it into hydrochlorate of ammonia, which is sublimed; and chloride of zinc, which is precipitated.

The most remarkable property of this compound is that it so much facilitates tinning, that we may easily tin copper or iron with pewter, lead, or zinc; zinc with pewter or lead; and even pewter with lead, and *vice versâ*.

It appears that it so well strips the metallic surfaces to which it is applied, that immediately on the contact taking place there are formed more fusible mixtures which determine the tinning; at least it is

thus that I explain to myself that singular experiment: to tin a plate of pewter by means of a plate of lead, and reciprocally a plate of the same lead with a plate of the same pewter.

The advantages which may be drawn from it are very great; the cheapness of the product permits the employment of it to be rendered general, and the following are the applications which I have already made of it. I have caused an iron kettle to be tinned with lead only; it has performed its office for about two months, in making liquids crystallize which contain a great excess of sulphuric acid, and no appearance of alteration can yet be discovered in it; all the instruments which clear that kettle, whether copper or iron, have also been tinned by means of lead.

Through economy I caused several large apparatus to be constructed of zinc, as well as lids of tubs and kettles; but the air, steam, heat, and cooling, soon spoiled my utensils, and the oxide of zinc was detached sometimes in very thick plates; by getting them made of tin, my economical object would have failed, and besides it is found in commerce only in plates of dimensions too small; I tinned with pewter, the surfaces exposed to the deteriorating actions, and I am now quite satisfied with them.

I think that this double chloride also acts as a reducing body; for I have a large iron laboratory-stove so worn by oxydation, that it was in holes in several places; I tried to get it tinned with lead, and it has become like new.

It is especially the solution of this body that must be employed; for it is essential that the surfaces to be tinned should be so moistened that the little cavities made by the oxydation may not be out of the reach of its action.

I make this objection because several persons have appeared to prefer employing it in powder; but the same results happen here as arise in the employment of borax for soldering.

If we apply *borax* for the purpose of soldering, with water holding borax in solution and in suspension, its preservative action begins to date from 100°; for, in disengaging itself, the water leaves on the surface of the piece to be soldered, borax which covers it entirely; but, if it is employed in powder, the success is much more hazardous, for that powder is first melted, then is poured in drops which leave intervals exposed to the very oxidizing action of the warm air, and it is only by a very strong red heat that it is spread on the surface in such a manner as to facilitate the combination of the solder with the metal.

ADDITIONAL NOTE ON OXYCHLORIDES WITH COMPOUND RADICALS.

BY M. BERZELIUS.

The excellent work of M. Malaguti on the reaction which chlorine exercises on the ethers, affords no less than seven new examples of that species of combination.

1. The *chloro-sulphuric ether* of M. Malaguti is composed, as we have shewn, of

1 at. of acetic acid	$=4\,C+6\,H$	$+30$
2 at. of acetic chloride	$=8\,C+12\,H+12\,Cl$	
$(\dot{\underline{A}}=C^4\,H^6\,O^3$ and $A\,\underline{Cl^3}=C^4\,H^6\,Cl^3)$	$\dot{\underline{A}}+A\,\underline{Cl^3}=12\,C+18\,H+12\,Cl$	$+30$

Which contains three times the number of simple atoms in the formula of M. Malaguti $=C^4\,H^6\,Cl^4\,O$.

2. The *sulphuretted ether* $C^4\,H^6\,S^2\,O$ contains, tripling the number of simple atoms,

1 at. of acetic acid	$=4\,C+6\,H$	$+30$
2 at. of acetic sulphide	$=8\,C+12\,H+6\,S$	
$(A\,S^2=\ddot{A})$ $\dot{A}+2\,\ddot{A}$	$=$ $12\,C+18\,H+6\,S$	$+30$

3. The *chloro-sulphuretted ether* $=C^4\,H^6\,S\,Cl^2\,O$, of which the number of simple atoms is multiplied by 6, contains two atoms of acetic acid, two atoms of acetic sulphate, and two atoms of acetic chloride, which may be represented by the combination of an atom of No. 1. and an atom of No. 2. $=(\dot{\underline{A}}+2\,\ddot{A})+(\dot{\underline{A}}+2\,A\,\underline{Cl^2})$. It is probable that in submitting acetic oxychloride (No. 1.) to sulphuret of lead, we shall obtain No. 2. or No. 3., according as the decomposition shall be more or less advanced, just as in submitting $Bz\,\underline{Cl^2}+\ddot{B}$ $(Bz=C^{14}\,H^{10})$ to sulphuret of lead, we obtain $\ddot{B}z+2\,\ddot{B}z$.

4. The *chloruretted acetic ether* $C^8 H^{12} Cl^4 O^4$ gives, by multiplying the number of simple atoms by $1\frac{1}{2}$,

2 at. of acetic acid	$=8\,C+12\,H$	$+60$
1 at. of acetic chloride	$=4\,C+6\,H+6\,Cl$	
$A\,\underline{Cl}+2\,\dddot{A}$	$=12\,C+18\,H+6\,Cl+60$	

This combination is proportional to those of sulphur, of chromium, of molybdenum, of tungsten, of benzoin with chlorine and oxygen.

5. The *chloride of formic ether* $C^6 H^8 Cl^4 O^4$, of which the number of atoms is tripled, gives

2 at. of formic acid	$=4\,C+4\,H$	$+60$
1 at. of formic chloride	$=2\,C+2\,H+6\,Cl$	
2 at. of acetic acid	$=8\,C+12\,H$	$+60$
1 at. of acetic chloride	$=4\,C+6\,H+6\,Cl$	
$(F=C^2 H^2)$ $(\dddot{F}\,\underline{Cl^3}+2\,\dddot{F})+(A\,\underline{Cl^3}+2\,\ddot{A})$	$=18\,C+24\,H+12\,Cl+120$	

6. The *chloride of camphoric ether* $C^{14} H^{20} Cl^4 O^4$, of which the number of simple atoms is tripled, gives

2 at. of camphoric acid	$=20\,C+28\,H$	$+60$
1 at. of camphoric chloride	$=10\,C+14\,H+6\,Cl$	
2 at. of acetic acid	$=8\,C+12\,H$	$+60$
1 at. of acetic chloride	$=4\,C+6\,H+6\,Cl$	
$(Ca=C^{10} H^{14})$ $(Ca\,\underline{Cl^3}+2\,\ddot{Ca})+(A\,\underline{Cl^3}+2\,\ddot{A})$	$=42\,C+60\,H+12\,Cl+120$	

7. The *chloride of benzoic ether* $C^{18} H^{16} Cl^8 O^3$, multiplied by 3, gives

2 at. of benzoic acid	$=28\,C+20\,H$	$+60$
1 at. of benzoic chloride	$=14\,C+10\,H+6\,Cl$	
1 at. of acetic acid	$=4\,C+6\,H$	$+30$
2 at. of acetic chloride	$=8\,C+12\,H+12\,Cl$	
$(Bz\,\underline{Cl^3}+2\,\ddot{Bz})+(2\,A\,\underline{Cl^3}+\ddot{A})$	$=54\,C+48\,H+18\,Cl+90$	

8. The *chloride of œnanthic ether* $C^{18} H^{20} Cl^2 O^3$, does not contain the radical of œnanthic ether. M. Malaguti has found that the alkalies, in destroying the acetic oxychloride, produce a new acid, which he has analysed and found composed of $C^{14} H^{22} Cl^4 O^3+\underline{H}$, of which the radical is consequently $C^{14} H^{22}$. Giving to this radical the symbol x, the acid in the anhydrous state will be composed of

1 at. of the acid of the radical x	$=14\,C+22\,H$	$+40$
1 at. of the chloride of the same x	$=14\,C+22\,H+8\,Cl$	
$x\,\underline{Cl^4}+\ddot{x}$	$=28\,C+44\,H+8\,Cl+40$	

It is therefore one of those oxychlorides, of which the acid is combined with the bases without letting the chloride be disengaged. If, as M. Malaguti supposes, and as is probable, that body enters into the composition of the chloride of œnanthic ether, this last contains

2 at. of acetic acid	$=8\,C+12\,H$	$+60$
4 at. of acetic chloride	$=16\,C+24\,H+24\,Cl$	
3 at. of the acid x	$=42\,C+66\,H$	$+120$
3 at. of the chloride $x\,\underline{Cl^4}$	$=42\,C+66\,H+24\,Cl$	
$2\,(2\,A\,\underline{Cl^3}+\ddot{A})+3(x\,\underline{Cl^4}+\ddot{x})$	$=108\,C+168\,H+48\,Cl+180$	

Which makes 2 atoms of acetic oxychloride for 3 atoms of the oxychloride or radical $C^{14} H^{22}$, and 6 times the number of simple atoms indicated in the formula of M. Malaguti.

As to the acetate of methylen, it appears that it has furnished the same combination as the ethylic formiate, as theory also led to foresee.

The chloropyromucic ether appears to contain, according to the last experiments of M. Malaguti, the ethylic oxide combined with an acid which is composed of an acid and a chloride. When it is saturated with bases, the acid does not separate itself from it. All conjecture on the composition of the acid and of the chloride which is united with it, would be premature at present.

PROCESS FOR ISOLATING CARBONATE OF STRONTIA FROM OTHER CARBONATES.*

When we have some of these salts mixed, the mixture is to be saturated with pure nitric acid diluted with water. Evaporate to dryness in order to remove all excess of acid and to peroxidize effectually the iron which may accompany the carbonates. The dry product is then introduced into a lengthened glass tube, closed at one of its extremities, and it is almost entirely filled with alcohol at 40°. It is to be frequently shaken after having been stopped with a close-fitting stopple. At the end of twenty-four hours it is to be allowed to make a deposit, and the alcohol, charged with nitrates of lime and magnesia, is to be taken away by a small pipe; the insoluble deposit is to be washed with new alcohol at 40°, and when this vehicle has in its turn been isolated, the undissolved deposit is to be submitted to alcohol at 25° of heat; then filtrate and evaporate to dryness. The product then obtained is nitrate of strontia; it crystallizes easily; dissolved in alcohol, it communicates to the flame of the latter an intense purple colour, particularly when care is taken to shake it during combustion. The solution of this nitrate gives, with an alkaline sulphate, a precipitate scarcely soluble; in fine, the nitrate, calcined with a strong red heat, leaves a residue soluble in water, very alkaline, forming with hydrochloric acid a crystallizing salt, in form of needles, &c.

ON THE BORACIC ACID LAGOONS OF TUSCANY.

BY JOHN BOWRING, LL.D.†

The borax regions of Tuscany are entitled to a detailed description. They are unique in Europe, if not in the world; and their produce is become an article of equal importance to Great Britain as an import, and to Tuscany as an export. They are spread over a surface of about thirty miles, and exhibit from the distance columns of vapour, more or less according to the season of the year and state of the weather, which rise in large volumes among the recesses of the mountains.

As you approach the lagoons, the earth seems to pour out boiling water as if from volcanoes of various sizes, in a variety of soil, but principally of chalk and sand. The heat in the immediate adjacency is intolerable, and you are drenched by the vapour, which impregnates the atmosphere with a strong and somewhat sulphurous smell. The whole scene is one of terrible violence and confusion—the noisy outbreak of the boiling element—the rugged and agitated surface—the volumes of vapour—the impregnated atmosphere—the rush of waters—among bleak and solitary mountains.

The ground, which burns and shakes beneath your feet, is covered with beautiful crystallizations of sulphur and other minerals. Its character beneath the surface at Monte Cerbole is that of a black marl streaked with chalk, giving it, at a short distance, the appearance of variegated marble.

Formerly, the place was regarded by the peasants as the entrance of hell, a superstition derived no doubt from very ancient times, for the principal of the lagoons and the neighbouring volcano still bear the name of Monte Cerboli (*Mons Cerberi*). The peasantry never passed by the spot without terror, counting their beads, and praying for the protection of the Virgin.

The borax lagoons have been brought into their present profitable action within a very few years. Scattered over an extensive district, they are become the property of an active individual, M. Larderel, to whom they are a source of wealth, more valuable perhaps, and certainly less capricious, than any mine of silver that Mexico or Peru possesses. The process of manufacture is simple, and is effected by those instruments which the localities themselves present. The soffioni, or vapours, break forth violently in different parts of the mountain recesses. They only produce boracic acid when they burst with a fierce explosion. In these spots artificial lagoons are formed by the introduction of the mountain streams. The hot vapour keeps the water perpetually in boiling ebullition; and after it has received its impregnation during twenty-four hours at the most elevated lagoon, the contents are allowed to descend to the second lagoon, where a second impregnation takes place, and then to the third, and so forth, till it reaches the lowest receptacle; and having thus passed through from six to eight lagoons, it has gathered one-half per cent. of the boracic acid. It is then transferred to the reservoirs, from whence, after a few hours' rest, it is conveyed to the evaporating pans, where the hot vapour concentrates the strength of the acid by passing under shallow leaden vessels from the boiling fountains above, which is quite at a heat of 80° of Reaümur,‡ and is discharged at a heat of 60°.§ There are from ten to twenty pans, in each of which the concentration becomes greater at every

* *Journal de Chemie Médicale*, Nov. 1839.

† From Dr. Bowring's Report on the Statistics of Tuscany.

‡ The boiling point.

§ 167° of Fahrenheit.

descent till it passes to the crystallizing vessels, from whence it is carried to the drying-rooms, where, after two or three hours, it becomes ready to be packed for exportation.

Though to the present proprietor (the Chevalier Larderel*) the merit attaches of having given to the boracic lagoons the great importance they now possess, a succession of adventurers had made many experiments, and had produced a considerable quantity of boracic acid, but at a cost (from the expenditure of combustible) which left little profit.† The small value that was attached to them may be seen in the fact, that the largest and most productive district of the lagoons, that of Monte Cerboli, was offered in perpetuity, so lately as 1818, at an annual ground-rent of 6*l.* 13*s.* 4d. per annum, though it now produces several thousand pounds sterling. The immense increase in their value arose from the simplest of improvements, the abandonment of the use of charcoal, and the application of the heat of the lagoons or soffioni to the evaporation of their own waters. Improvements, however, and very important ones, particularly by subjecting the waters to a succession of impregnations, had been gradually introduced by a Signor Ciaschi, and the importation of boracic acid from Tuscany into France, before 1817, had been between 7000 and 8000 pounds, of a quality gradually increasing in purity; but Ciaschi perished miserably, in consequence of falling into one of the lagoons which he himself had excavated, leaving his family in a state of extreme poverty. His death (which happened in 1816) naturally threw a damp upon adventure. The experiments were resumed in the following year, and in the midst of violent claims and controversies, M. Larderel has become the monopolist of the boracic productions of Tuscany.

With the increased production of boracic acid has arisen an increased demand, growing out of the more extensive application of it to manufacturing purposes. In about four years, the quantity has been quadrupled by superior modes of extraction, and by greater care employed in the collection of the boracic vapour. In 1833, about 650,000 Tuscan pounds were obtained; in 1836, two millions and a half.

But it appears to me that the powers and riches of these extraordinary districts remain yet fully to be developed. They exhibit a great number of mighty steam-engines, furnished by nature at no cost, and applicable to the production of an infinite variety of objects. In the progress of time, this vast machinery of heat and force will probably become the moving central point of extensive manufacturing establishments. The steam, which has been so ingeniously applied to the concentration and evaporation of the boracic acid, will probably hereafter, instead of wasting itself in the air, be employed to move huge engines, which will be directed to the infinite variety of production which engages the attention of labouring and intelligent artisans; and thus, in the course of time, there can be little doubt that these lagoons, which were fled from as objects of danger and terror by uninstructed man, will gather round them a large and intelligent population, and become sources of prosperity to innumerable individuals through countless generations.

The number of establishments is nine.‡ The whole amount produced varies from 7000 to 8000 pounds (of 12 ounces) per day. The produce does not appear susceptible of much extension, as the whole of the water is turned to account; the atmosphere has, however, some influence on the result. In bright and clear weather, whether in winter or summer, the vapours are less dense, but the depositions of boracic acid in the lagoons are greater. Increased vapours indicate unfavourable change of weather, and the lagoons are infallible barometers to the neighbourhood, even at a great distance, serving to regulate the proceedings of the peasantry in their agricultural pursuits.

It had long been supposed that the boracic acid was not to be found in the vapours of the lagoons; and when it is seen how small the proportion of acid must originally be, it will not be wondered at that its presence should have escaped attention. In the lowest of the lagoons, after five, six, and in some cases a greater number of impregnations, the quantity of boracic acid given out does not exceed one-half per cent.; thus, if the produce be estimated at 7500 pounds per day, the quantity of saturated water daily discharged is a million and a half of Tuscan pounds, or five hundred tons English.

The lagoons are ordinarily excavated by the mountaineers of Lombardy, who emigrate into Tuscany during the winter season

* While these sheets have been passing through the press, the Grand Duke of Tuscany has conferred on M. Larderel the title of Count de Pomerance.

† Hoefer first announced the presence of boracic acid in the Maremman districts; and Mascagni in his Commentaries suggests the manufacture of borax as an object worthy of attention. Professor Gazzeri in 1807, made experiments, which, however, seemed to shew that the quantity of boracic acid contained in the waters was too small to promise much success.

‡ The principal are Monte Cerboli, Monte Rotondo, Susso, Serazzano, and Castelnuovo.

when their native Apennines are covered with snow. They gain about one Tuscan lira per day. But the works are conducted, when in operation, by natives, all of whom are married, and who occupy houses attached to the evaporating pans. They wear a common uniform, and their health is generally good.

A great improvement in the cultivation, and a great increase in the value, of the neighbouring soil has naturally followed the introduction of the manufacture of the boracic acid. A rise of wages has accompanied the new demand for labour; much land has been brought into cultivation by new directions given to the streams of smaller rivers. Before the boracic lakes were turned to profitable account, their fetid smell—their frightful appearance, agitating the earth around them by the ceaseless explosions of boiling water, and not less the terrors with which superstition invested them,*made the lagoons themselves to be regarded as public nuisances, and gave to the surrounding country a character which alienated all attempts at improvement.

Nor were the lagoons without real and positive dangers, for the loss of life was certain where man or beast had the misfortune to fall into any of those boiling baths. Cases frequently occurred in which cattle perished; and one chemist, of considerable eminence, met with a horrible death by being precipitated into one of the lagoons. Legs were not unfrequently lost by a false step into the smaller pits (*putizze*), where, before the foot could be withdrawn, the flesh would be separated from the bone.

That these lagoons, now a source of immense revenue, should have remained for ages unproductive; that they should have been so frequently visited by scientific men, to none of whom (for ages at least) did the thought occur, that they contained in them mines of wealth, is a curious phenomenon; nor is it less remarkable, that it was left for a man, whose name and occupation are wholly disassociated from science, to convert these fugitive vapours into substantial wealth.

FALL OF A METEORITE IN MISSOURI, FEB. 13, 1839.†

On the afternoon of the 13th of February, 1839, a meteor exploded near the settlement of Little Piney, Missouri, (lat. 31° 55′ N.; lon. 92° 5′ W.) and cast down to the earth one stony mass or more in that vicinity. Mr. F. Shepherd, of this city, who was at the time exploring this region, hearing of the explosion of the meteor, exerted himself to collect all the circumstances of the occurrence. He subsequently succeeded in obtaining several fragments of one of the stones thrown down by the meteor, and has favoured me with an opportunity to examine these fragments, and has also communicated to me the details below related.

At little Piney, Mr. Harrison and others saw the meteor burst in pieces, and in a minute or a minute and a half afterwards, they heard three explosions in quick succession. Some of the inhabitants went in quest of the stones which they supposed had fallen, and finally found a tree which appeared to have been recently injured by the collision of some solid body. Near this tree they discovered (although the ground was covered with three or four inches of snow,) one of the meteoric stones, about as large as a man's head, partly imbedded in the earth; and from the circumstance of its position and appearance, there could be no reasonable doubt that this was the body which had struck the tree.

The total weight of the fragments which Mr. S. has brought home, is 973 grains. The specific gravity of one of the small fragments is 3·5; but different portions of the stone may vary slightly in this respect, as they contain more or less of the metallic matter. The resemblance between this meteoric and those of Tennessee, (Silliman's Journal, xvii. 236,) of Georgia, (Ib. xviii. 389,) and of Weston, Conn., is very close, and one might almost imagine that they were all parts of the same original mass. The cohesion of the stone is not great, as it crumbles under a moderate blow. Two of the fragments retain portions of the crust or exterior coating. This is a fifteenth of an inch thick, and bears evidence of intense ignition and partial fusion. It is black, with a wrinkled or cellular surface, and is traversed with seams. The general colour of the interior is an ash grey. The whole mass is studded with metallic particles, (varying from the size of small shot down to mere points,) and presents numerous rusty spots, and occasional small spheroidal concretions, which do not appear to differ in materials from other parts of the stone. The little metallic masses (doubtless of nickeliferous iron) are attracted by the magnet, and are generally permeated by the earthy matter. They are mostly of an iron-white colour, but several are yellow and slightly iridescent. One of these minute masses being removed from the stone, it

* So unwilling were the peasants to settle in these districts, that very extraordinary encouragements were held out to them.

Many mineral waters are in the neighbourhood of the lagoons, some of which possess medical virtues, and are visited by the Tuscans in the bathing season.

† *Silliman's Journal*, vol. xxxvi. p. 385.

was by the hammer at once extended into a thin lamina, and was evidently malleable.

E. C. HERRICK.

Sept. 25, 1839.

ON A NEW CHEMICAL COMBINATION OF ARSENIC, MERCURY, AND IODINE; AND ON ITS MEDICINAL EMPLOYMENT.*

BY MR. DONOVAN.

Triturate 6·08 grains of finely levigated metallic arsenic, 15·38 grains of mercury, and 50 grains of iodine, with one drachm measure of alcohol, until the mass has become dry, and from being deep brown has become pale-red. Pour on eight ounces of distilled water; and after trituration for a few moments, transfer the whole to a flask; add half a drachm of hydriodic acid, prepared by the acidification of two grains of iodine, and boil for a few moments. When the solution is cold, if there be any deficiency of the original eight ounces, make it up exactly to that measure with distilled water. Finally filter.

The theory of this process need scarcely be adverted to. By the long-continued trituration of arsenic, mercury, iodine, and alcohol, the metals are converted into iodides, which combine. The mass by solution in water is converted into an hydriodate of arsenic and mercury. The quantities of the two metals are so adjusted, that when converted into protoxides by decomposition of a portion of the water in which they are dissolved, there will be eight grains of protoxide of arsenic, and sixteen of protoxide of mercury. The quantity of water is such that each drachm measure of the solution will contain exactly one-eighth of a grain of protoxide of arsenic, and one-fourth of a grain of protoxide of mercury. I conceive that the quantity of mercury ought to be double that of the arsenic, in order to insure a slow and moderate, yet adequate mercurial action, along with the proper effect of the arsenic.

Of this *liquor hydriodatis arsenici et hydrargyri*, each drachm measure consists of—

Water, one drachm.
Protoxide of arsenic, one-eighth of a grain.
Protoxide of mercury, one-fourth of a grain.
Iodine, (converted into hydriodic acid,) four-fifths of a grain.

The colour of the solution is yellow, with a pale tinge of green: its taste is slightly styptic. It cannot be properly conjoined with tincture of opium, or with sulphate, muriate or acetate of morphia; for all these produce immediate and copious precipitates in it. Hence if opiates are to be used during the exhibition of this arsenico-mercurial liquor, they must be taken at different periods of the day. Tincture of ginger produces no bad effect. The following formula is proper:—

℞. Liquoris Hydriodatis Arsenici et Hydrargyri drachmas duas.
Aquæ distillatæ uncias tres cum semisse.
Syrupi Zingiberis semunciam. Misce.
Divide in haustus quatuor. Sumatur unus mane nocteque.

Thus one-sixteenth of a grain of protoxide of arsenic, and one-fourth of a grain of protoxide of mercury, would be taken in each dose, along with two-fifths of a grain of iodine, which being in the state of combined hydriodic acid, will be much diminished in energy of medical effect. This is no doubt the proper dose to begin the exhibition of arsenic with; but it will be very soon necessary to increase it.

The division into draughts is here necessary: first, to insure accuracy of the dose, so essential in the case of this active medicine: and next, to prevent injury to the ingredients by the use of a metallic spoon as a measure—the general way in which, unfortunately, the dose of a medicine is determined.

Mr. Donovan recommends this in cases in which its ingredients have been found serviceable.

* *Dub. Journ.* Nov. 1839.

ON VEGETABLE TISSUES AND ON MANURES.

BY M. PAYEN.

In two separate memoirs, but connected in certain respects, M. Payen has shown that the elementary composition of vegetable tissues, freed from every foreign substance was the same, to whatever order the vegetable might belong, from the most complicated phanerogamia to the simplest cryptogamia. That this composition is isomeric with that of certain vegetable products; starch, dextrine, normal and fluid inulin. Other resemblances exist between starch and vegetable membranes. Thus the amylaceous substance forms an integrant of the cortical part of the lichen of Iceland, which does not afford any starch in the seeds.

This elementary composition of vegetable membranes, which is ternary, and susceptible of undergoing a certain chemical action, such as its transformation into isomeric dextrine and sweet glucose, presents, according to M. Payen, a sure means of distinguishing the membranes of vegetable from animal tissues. Azote is also exhibited in

vegetables, but it makes part of the organic bodies in solution in the liquids in the midst of which are formed the vegetable membranes, and which seem indispensable to their development, by a simple effect of contact, since they are not fixed in them; whence the considerable proportion of azote contained in all nascent vegetation.

Whence also the necessity of azotous manure in agriculture. M. Payen proves that manures, even vegetable, are only valuable in proportion to the quantity of azote they contain, and that if certain vegetable detritus, such as exhausted turfs and soils, become unfit for agriculture, it is because they have lost the azote which they contained. Indeed, he established on this subject a practical certainty, by showing a scale of the pecuniary value of the different manures in use, that their value is so much higher, as they contain a greater proportion of azotous matter.

ON THE EXISTENCE OF IODINE IN THE PRODUCTS OF THE COMBUSTION OF COAL-PITS.

BY M. BUSSY.

M. Bussy called to mind the small number of natural products in which iodine has hitherto been met with. Besides certain vegetables and salt-springs, it has been found only once by Vauquelin in an ore of silver, and M. Delrio in an ore of silver and lead. The existence of iodine in the products of coal mines is, therefore, an interesting fact.

At Commentry, pit-coal is worked in the open air; heaps of the pyrites which it contains become heated and take fire spontaneously; they disengage vapours charged with sulphurous and hydrochloric acids, which allow white or reddish yellow efflorescence to be deposited upon the opening of the mine; they contain sal ammoniac, and are coloured by sulphur and sulphuret of arsenic. M. Bussy has since recognized in it hydriodate of ammonia.

He thinks that this salt might also be found in the products of other coal mines; but as it is very rapidly decomposed, it could only be proved by experiments made upon the spot.

ON THE COMPOSITION OF MILK.*

BY M. DONNE.

M. Donné considers milk as consisting of a fluid holding in solution caseum, a particular variety of sugar and salts, and in a state of suspension globules of fatty matter or butter. Alcohol and ether dissolve the fatty or milky globules, but have no action on the caseum. A watery solution of iodine colours the caseum yellow, but has no action on the milky globules. These facts prove that the caseum forms no part of the milky globules, and does not exist in a concrete form in the milk.

All the milky globules are retained by the filter, and the liquid which passes through it is as transparent as water, and on the addition of an acid deposits the caseum. This fact proves that the caseum is in a state of solution, and also that the white colour of the milk is owing to the presence of the milky or fatty globules which are suspended in it. Milk may, therefore, be considered as an emulsion.

When milk is allowed to stand, the cream ascends to the surface. The caseum is only the separation of the milky globules on account of their lighter specific gravity; and if the milk be examined in a transparent vessel, it will be seen that the layer next the cream is the whitest, whilst that at the bottom of the vessel is of a greenish hue, and semitransparent. This difference of hue is owing to the greater or lesser proportion of milky globules in the different parts of the fluid.

When it is allowed to stand some time longer it becomes acid, though it was alkaline when first drawn. The cream gradually thickens, the caseum becomes consolidated, gaseous matters are disengaged, a strong odour of rotten cheese is perceived, and the microscope discovers a multitude of animalcules and infusory vegetables. If the milky globules be previously separated, they are found to become rapidly acid; whilst the watery portion holding in solution the caseum undergo the alkaline or putrefactive decomposition.

The infusory vegetables in milk are not observable till long after it has undergone the acid change. It cannot, therefore, be considered as the cause of the acetous fermentation, as is remarked in vegetable infusions, which undergo the alcoholic fermentation. The infusory animalcules exist equally in the acid as in the alkaline part of the milk during these changes.

M. Donné has remarked that there is a fixed relation between the secretion of the colostrum in the breast before delivery, and the secretion of the milk after that process; and he thinks that women may be in this respect divided into three classes. The *first* class includes those in whom there is scarcely any milky secretion till delivery is over. In them the colostrum consists of a viscous liquid containing a very few milky globules mixed with granular bodies. In

* *Compte Rendu de l'Academie des Sciences*, Sept. 16, 1839.

these circumstances the milk after delivery is always poor, and in small quantity. In the *second* class the colostrum is more or less abundant, but is poor in milky globules, which are small and ill-formed. Besides the granular bodies, mucous globules are detected in the colostrum. After delivery, the milk is more or less abundant, but is poor and serous. In the *third* class, the colostrum is rich in regularly-formed milky globules, and is only mixed with the usual granular bodies. The milk which is secreted after delivery is abundant, rich, and of good quality. It is this class of women who ought always to be preferred as nurses.

ON THE SUPPOSED EXISTENCE OF FLUORIC ACID IN ANIMAL MATTER.*

BY G. O. REES, M.D., F.G.S.

Baron Berzelius has published a paper in the 61st vol. of the "*Annales de Chimie;*" in which he states, fluoric acid may be detected in human teeth, bones, and urine; and may be demonstrated, in the latter case, by operating on the precipitate obtained from the excretion by means of lime-water. Since the publication of this paper by Berzelius, the existence of fluoric acid, as a constituent of the animal substances above mentioned, has been acknowledged by chemists generally; and it is mentioned as such in the standard chemical works of the present day.

Having lately been engaged in the analysis of human bone, with more especial reference to those ingredients which have been stated to exist in small proportion, I was led to search particularly for fluoride of calcium. My experiments were made in the usual manner, by trying to obtain the corroding action of fluoric acid on a plate of glass, which was used as a loose cover to a platinum crucible, which contained the substance for examination, mixed with strong sulphuric acid. A gentle heat was applied to the bottom of the containing vessel. In this way, several specimens of human bone (both before and after calcination) were subjected to experiment; but in no instance could I obtain any action upon the glass.

The experiment which the Baron recommends, in order to obtain corrosion from bone-earth, is, to distil equal parts of strong sulphuric acid, and water upon it, until the measure of water is brought over. He states, that the distilled liquor, if evaporated in the glass receiver, will produce a corrosion. I repeated this experiment, using 100 grains of bone-ash, and an ounce of the acid mixture; but could obtain no action on the receiver, by evaporating the distilled liquor; nor was there any corrosion or opacity produced on any part of the apparatus.

During the evaporation of the last portions of the liquor, dense white fumes appeared; and there was some difficulty in vaporizing the whole of it. On neutralizing a portion with ammonia, and testing it with nitrate of silver, a yellow precipitate of phosphate of silver was thrown down. A further examination showed the presence of sulphuric acid, and traces of hydrochloric acid. I was much surprised to find phosphoric acid in this result of aqueous distillation, as the heat had not been urged during the process; for I had considered that acid as of too fixed a nature to volatilise with water at so low a temperature. It appeared to me now, that the presence of phosphoric acid, in this distilled liquor, might be a source of fallacy in the above experiment for establishing the presence of fluoric acid as a constituent of human bone; for it is a well-known fact, that phosphoric acid, if heated on glass of inferior quality till it volatilize, will act upon it with considerable energy;† and all the animal substances in which fluorine has been said to exist, are particularly rich in phosphoric acid;—thus the ashes of ivory, of human bone, and the enamel of teeth, as also the precipitate obtained from urine by means of lime water, are all of them composed, in very great part, of phosphate of lime. Mr. Richard Phillips has mentioned (in the Annals of Philosophy, vol. v.) that when the water contained in uranite is driven off from the powdered mineral, a portion of the phosphoric acid is volatilized with it; the heat used being that of a common spirit-lamp. This is the only fact with which I am acquainted (with the exception of my own observation), to show that phosphoric acid will volatilize with water. The heat used in Mr. Phillips's experiment was, most probably, considerably higher than any which I applied. There seems no doubt that phosphoric acid is much more volatile than it has heretofore been supposed.

Having failed in detecting fluoric acid in human bones, I determined on testing for its presence in the enamel of teeth, in recent ivory, and in the precipitate obtained from urine by the addition of lime-water.

* *Guy's Hospital Reports*, Aug. 1839.

† It must be borne in mind, that the fluoric acid acts with facility on every kind of crown or flint glass, however good their quality may be. The supposition that bad glass was used in the experiment is the only means I have of explaining away that which I feel sure is an error on the part of several continental chemists.

Two different specimens of ivory (tusks of the elephant) gave no evidence of the presence of fluoric acid, when carefully tested, either before or after calcination; and I was equally unsuccessful with the enamel of human teeth and the precipitate from the urine.*

In these experiments, when I had failed in acting on the glass, I always found that the addition of 0·3 grains of fluoride of calcium to the experiment produced a strong and indelible mark on the surface of the glass test-plate. I mention 0·3 grains, because it will always be found sufficient to produce a most unequivocal corrosion; though I obtained satisfactory results by the addition of a much less quantity. I have had only one opportunity of examining fossil ivory; and in that instance I could not ascertain its locality: on submitting it, however, to the tests used for recent ivory, bone, &c., I obtained immediate action on the glass.

In conclusion, I must express my firm conviction, that fluoride of calcium, as an ingredient in fossil ivory, must be regarded as an extraneous matter, introduced by the partial mineralization of the animal substance;—that no such constituent exists in recent ivory, the enamel of teeth, human bone, or urine;—in fact, that fluoride of calcium should be expunged from the list of the constituents of animal substances.

ELECTRO-MAGNETIC TELEGRAPH.†

BY MR. MORSE.

(*Professor at the University of New York.*)

The instrument was put in action under the inspection of the Academy; and the following is a literal translation of a great part of the note which Mr. Morse has sent to the perpetual secretaries:—

Mr. Morse believes that his instrument is the first realised application that has been made of electricity in the construction of a telegraph. This instrument was invented in October 1832, while the inventor was on a journey from Europe to America by the packet *Sully*. The fact is certified by the captain of the vessel and several passengers. Among the latter was found Mr. Rives, minister of the United States to the French government. Mr. Rives wrote to Mr. Morse, on the 27th September, 1837:—

"I remember perfectly that you explained to me the idea of your ingenious instrument during the voyage which we made together in the autumn of 1832. I remember also that during our numerous conversations on this subject, I suggested several difficulties, and that you removed them with promptitude and confidence," &c. &c.

W. C. Rives.

In the letter of Mr. W. Pell, captain of the packet, dated September 27, 1837, we remark particularly this passage:—

"When I examined your instrument, a few days ago, I recognised in it the principles and mechanical arrangements which I had heard you develope on board my vessel, in October, 1832."

The idea of applying galvanism to the construction of telegraphs is not new. Dr. Coxe, a distinguished citizen of Philadelphia, made mention of it in February, 1816, in a note inserted in Dr. Thomson's Annals, vol. vii. p. 162, 1st series; but he had not then the means of putting it in practice.

The register or reporter is under control of the person who sends the news. Indeed from the extremity called port-compositor, the mechanism of the reporter may be put in motion and stopped at will. The presence of a person to receive the news is not then necessary, although the sound of a bell set ringing by the mechanism announces that some one is about to write.

The distance at which the American telegraph has been tried is ten English miles or four French post leagues. The experiments have been witnessed by a commission of the Franklin Institute of Philadelphia, and a committee nominated by the congress of the United States.

The reports of the two commissions (we need not transcribe them) were extremely favourable.

The committee of the congress has proposed to devote 30,000 dollars to an experiment on a large scale concerning this mode of communication. The expense of constructing the new telegraphic system would be, according to Mr. Morse, 3,500 francs per English mile, which would amount to 14,000 per French post league. The machine which it would be necessary to establish at each extremity would not cost more than 15,000 francs. Mr. Morse thinks that these wires once placed would last half a century, at least unless broken on purpose. It should be remarked that if the network were complete, the news might go from one city to another by several directions, and without any appreciable loss of time.

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* I was much pleased to observe, that Mr. Pepys, in an analysis of enamel published in Mr. Fox's work on the Teeth, does not mention fluoride of calcium as an ingredient of that substance. This analysis was made by Mr. Pepys in 1833, several years after the fluoride had been declared a constituent of the enamel.

† *Annales de Chimie et de Physique*, October, 1839.

It is needless to say that this mode of communication has, over the ordinary telegraph, the advantage of being capable of acting by night as well as by day, in rain and in fog as in fair weather.

Since the date of the invention of Mr. Morse, other apparatus, based on the same principles, have been advertised, among which the most celebrated are those of M. Steinheil of Munich, and Mr. Wheatstone of London: the mechanisms differ much.

The American telegraph employs only a single circuit:* the following is an abridged description of it:—

At the extremity of the circuit, where the news are to be received, is an apparatus named the register (or reporter). It consists of an electro-magnet, of which the wire-envelope forms the continuation of the thread of the circuit.

The bolt of this magnet is attached to the end of a little lever, which, at the opposite extremity, carries a pen, which is a strip of paper which moves at will by the aid of a certain number of wheels. At the other extremity of the circuit, namely, at the station whence the news are sent, exists an apparatus called a portule (or port compositor). It consists in a battery (or generator of galvanism) with two poles, by which the circuit is completed. Near the battery a portion of this circuit is broken; the two disjoined extremities are introduced into two contiguous cups of mercury.

By the aid of a pronged wire attached to the extremities of a little lever, the two cups may be connected or isolated at pleasure. Thus the circuit is closed or broken at will. The action of the mechanism is as follows:—

When the circuit is close, the magnet is changed; it draws the bolt, and the movement of the latter causes the pen to touch the paper. When the circuit is interrupted, the magnetism of the horse-shoe ceases, the bolt returns to its former position, and the pen is removed from the paper. When the circuit is closed and opened rapidly, there is produced upon the moveable paper simple points; if, on the contrary, it remains closed during a certain time, the pen marks a line so much longer as the duration of the closing is longer. The paper presents a broad interval of white if the circuit remains open for some length of time. These points, these lines and white spaces lead to a great variety of combinations. By aid of these elements, Professor Morse has constructed an alphabet, and signs of cyphers. The letters may be written with great rapidity by means of certain types which the machine causes to move with accuracy, and which impress on the lever bearing the pen suitable movements. From forty to five-and-forty of these characters may be traced in one minute.

* Let us suppose that the places which ought to be put in relation occupy the three angles of a triangle, the four angles of a quadrilateral figure, or certain points of a closed curve, a simple wire passing through all these points will be sufficient, (theoretically at least.)

NEW APPARATUS FOR LIGHTING THE MICROSCOPE, BY MEANS OF THE LIGHT OF OXYHYDROGEN GAS.†

BY M. AL. DONNE.

I call the attention of the Academy to the applications I have made of the solar microscope, and of the microscope illumined by oxyhydrogen gas, to the demonstration and observation of microscopic objects; this subject, to which I have for several years devoted my studies and cares, seems to me of sufficient interest to merit examination by a commission of the Institute.

I taught more than a hundred pupils, last summer, the texture of the different elements of animal and vegetable organization, the composition of various fluids, the phenomenon of circulation in animals and plants; I have been able to shew all the details of minute anatomy, from the structure of the skin, whose image is so clearly painted upon a screen with the disposition described by M. Breschet, and the arrangement of its layers demonstrated by M. Flourens, to the molecules of the muscular and nervous tissues, and to the pathological products of the membranes, to those of urine, &c.

I have even been able to avoid the inconvenience of heat, so incommoding to the focus of the solar microscope, without employing any intermediary substance.

The inconstancy of the sun in our climate having very soon become an insurmountable obstacle, at least during eight months of the year, to the demonstration which I have undertaken, and the object which I pursue, I determined on applying the light of oxyhydrogen gas to the illumining of the microscope; but the apparatus, such as had hitherto been constructed, was totally unfit for a scientific course; and accordingly this valuable instrument, capable of rendering so great services, had heretofore remained a simple object of curiosity to a few, without any instructive application; I hope that its use will be extended, and at the same time that it will now become of more simple and commodious employment.

† *Comptes Rendus*, No. 6, Feb. 10, 1840.

I am anxious to say that it is to M. Seligues, whose inventive and fertile genius is well appreciated by those who are acquainted with his labours, that I owe the ingenious disposition of the new apparatus which I submit to the examination of the Academy.

FIXATION OF COLOURS IN PHOTOGRAPHIC IMAGES.*

BY M. BIANCHI.

M. Bianchi, an optician of Toulouse, announces that in his photographic experiments, according to the process of M. Daguerre, by modifying it in a manner which he has not made known; he is able to fix, upon the metallic plate, several of the colours of reproduced images, particularly red. It appears that the green of trees is painted in green, but that artificial green, that of venetian blinds, for instance, is reproduced in red. M. Bianchi promises to give the details of his processes hereafter.

EMPLOYMENT OF THE DRUMMOND LIGHT IN PHOTOGRAPHY.†

BY MM. BIOT AND DONNE.

M. Biot presented, on the part of M. Donné, and laid before the Academy, several photographic images of natural objects operated on the layer of iodine by the light of oxyhydrogen gas inflamed on lime and acting through a system of lenses, disposed so as to produce different degrees of magnifying. The optical apparatus employed is merely a solar microscope whose illuminating body is the little mass of lime upon which the combustion is operated; and the transparent object of which it is desired to produce the magnified image is inserted in it in the same manner; but instead of throwing the image on a white insensible cloth, as is usually done in this kind of experiments, M. Donné receives it on the layer of iodine of M. Daguerre, on which it is very clearly imprinted.

There is, says M. Biot, an evident utility in substituting in such experiments the solar light by an artificial one, which may be at all times prepared, but there are besides several physical consequences to be deduced from the results here obtained. At first it was thus ascertained that the light which was developed in the combustion of the two gases on the lime contains the elements of radiation suitable and sufficient to modify the layer of iodine, which was an analogical deduction, but not, however, a certain one, from the effects already observed by M. Daguerre concerning the impressibility of the layer of iodine, by the radiation of an Argand lamp which had necessarily traversed the glass chimney with which the flame was surrounded. In the experiments of M. Donné, the light emanating from the gas traversed seven glasses disposed in succession; but this fact, which may appear extraordinary, is consistent with the results of experiments already made concerning radiations in general; for they have proved that radiations capable of exciting chemical effects are passed, like calorific radiations, into a very slight thickness of the first glass they traverse; so that the ulterior layers of this glass, if they are of the same nature, do not operate more than a very insensible absorption. Thus, in the experiments of M. Donné, the radiation which had traversed the first lens ought only to undergo in the following the losses resulting from different reflections on the surfaces of incidence and emergence.

THEORY OF CHLORIDES OF OXIDES.‡

BY M. MILON.

M. Milon communicated a chemical essay of great interest, respecting the theory of compounds hitherto designated by the name of chloride of oxides or hypochlorites.

Every one has heard of chloride of lime serving to disinfect, and removing the colour of certain substances; the compounds of that kind are obtained by putting the chlorine in contact with an oxide; lime, for example. In the present opinion of chemists a rather complicated action took place in this operation: the chlorine began by taking up a part of the oxygen of the base, and passed into the state of hypochlorous acid, which M. Balard thought he had isolated; this acid became united with the base itself, and then formed a hypochlorite.

The essay of M. Milon renders this theory exceedingly simple, and reduces it to the theory of substitutions, which is daily becoming enriched with new facts. According to M. Milon there would take place something quite analogous to that which occurs when an oxide—as lime, for example—is combined with a new quantity of oxygen in order to convert it into a binoxide; the chlorine which is united with the lime plays the part of that new portion of oxygen, and takes the place of it in equal proportion, so that instead of having a binoxide composed of one atom of calcium and two atoms of oxygen, we have an oxide in which an atom of chlorine takes the place of an atom of oxygen.

* *From L'Institut*, No. 315, Jan. 9, 1840.

† *Comptes Rendus*, Feb. 1840.

‡ *Journal de Chemie Médicale*, Sept. 1839.

II. CHEMICAL MANUFACTURES.

PURIFICATION OF COPPER.*

BY MR. LEWIS THOMPSON.

THE art of manufacturing copper appears to have been known from the most remote antiquity; indeed, judging from the purity of the coins and warlike instruments which have descended to us, we might at first suppose that this, like some other of the arts formerly in use, had been partially lost, and that the ancients were better acquainted with the mode of making pure copper than we are at the present day. The great purity of their cupreous alloys is, however, much better accounted for, by attributing it to the richness of the ores then in use: for, in all probability, they were unable to extract copper from such poor pyritic ore as is now employed for that purpose, and from which English commercial copper is obtained, in a state of sufficient purity for the ordinary purposes to which copper is applied. It is always, however, contaminated with the foreign matters existing in the ore: these are chiefly iron, lead, arsenic, sulphur, and antimony: carbon, too, is occasionally imparted during the process of reduction. These impurities vary from two to seven per cent., and greatly impair the ductility and malleability of the metal. With one-half per cent. of arsenic, sulphur, or antimony, copper is decidedly brittle under the hammer, and with one per cent. this effect becomes very obvious. Lead and iron have a less injurious effect; but in the proportion of two per cent., they materially affect the colour and texture, and the alloy has a harsh, dull, and mottled appearance when polished. With a very small quantity of carbon, copper is brittle, and has a gray, uneven fracture.

The Swedish copper being almost free from these impurities has long been held in high estimation, not only in this country, but also on the Continent, where the finer kinds of brass are made almost solely with it, to the exclusion of the English copper; a cheap and effectual mode of removing the impurities from which has long been a desideratum. The following method will be found to answer that purpose, and its simplicity is such as to require no particular care or management on the part of the workmen:—

Take of impure copper.. 100 parts;
Copper scales .... 10 parts;
Ground bottle glass
or any other flux. 10 parts;

heat the whole together in a covered crucible, and keep the copper in a state of fusion for twenty minutes or half an hour, at the end of which time it will be found at the bottom of the crucible perfectly pure. The quantity of copper scales must vary in proportion to the supposed impurity of the copper to be operated on; but the proportions here given will be found to answer very well for the average kind of English copper. The explanation of this process is sufficiently simple: the impurities contained in the copper, consisting, as we have seen, of iron, lead, arsenic, &c., combine with the oxygen, contained in the copper scales, and form oxides or acids, which are dissolved by the flux, or fly off in a gaseous form, leaving the purified copper, together with that reduced from the scales, at the bottom of the crucible; consequently, the copper obtained exceeds that put into the crucible, the gain generally averaging from one to one and a half per cent. In this way I have obtained perfectly pure copper from brass, bell-metal, gun-metal, and several other alloys containing from four up to fifty per cent. of iron, lead, antimony, tin, bismuth, arsenic, &c.

In my earlier experiments, I made use of the oxide of copper obtained from the acetate or sulphate, and proposed in practice to employ some of the native oxides of sufficient purity, such as the malachites. Mr. Aiken, however, has since kindly pointed out to me the scales of copper, as the cheapest and most abundant source for obtaining the oxide, since they are produced in large quantities at every copper manufactory. I have repeated nearly the whole of my experiments with them without observing any variation in the result, as might, indeed, have been anticipated.

* From the *Transactions of the Society of Arts, &c.*

ON THE INTRODUCTION OF PLASTER IN THE MANUFACTURE OF PAPER, AND MEANS OF DETECTING THIS ADULTERATION.

BY M. WISLIN.

M. Wislin has detected the presence of plaster in the proportion of fifteen to twenty-five per cent. in the paste of several samples of paper intended to be sold by weight. This very prejudicial fraud to the interests of the purchaser, presents again serious inconveniences as to certain uses for which the paper is destined, particularly for

lithography. M. Wislin has found that papers of this nature destroyed in a very short time the lithographic designs of which it was desired to reproduce the proofs.

M. Wislin analysed the paper by torrefying it gently to destroy the size, boiling it with the carbonate of potassa to transform the plaster into sulphate of potassa, with the solution of which he poured a salt of baryta, which showed the quantity of sulphate of lime sought by that of the sulphate of baryta formed; but he points out a means more within common reach to detect the presence of plaster; it is to calcine the paper in a close vessel, and to dilute the residue with vinegar, in a silver spoon: if sulphuretted hydrogen is disengaged, which blackens the spoon, the presence of a sulphate in the paper will be shown.

EMPLOYMENT OF THE ELECTRICAL PROPERTIES OF BODIES FOR THE DETECTION OF THE ADULTERATIONS OF WHICH THEY ARE THE SUBJECT.

BY M. ROUSSEAU.

M. Rousseau, the inventor of the diagometer which bears his name, and by the aid of which the purity of olive oil is tested, announces that he has applied it to the examination of chocolate and coffee. Thus pure chocolate is entirely insulating, but the addition of fecula gives it conducting power. Coffee, on the contrary, is a good conductor, and the presence of chicory has the effect of diminishing, and even of extinguishing this property.

ON THE DISADVANTAGE OF USING BLACK PAINT ON BOARD SHIP.*

BY MR. LEWIS THOMPSON.

There is nothing that will prove this evil more than by observing the black streaks of a ship after being in a tropical climate for any length of time. It will be found that the wood round the fastenings is in a state of decay, while the white work is as sound as ever: the planks that are painted black will be found split in all directions, while the frequent necessity of caulking a ship in that situation likewise adds to the common destruction; and I am fully persuaded, that a piece of wood painted white will be preserved from perishing, as long again, if exposed to the weather, as a similar piece painted black, especially in a tropical climate.

I have heard many men of considerable experience say, that black is good for nothing on wood, as it possesses no *body* to exclude the weather. This is indeed partly the case; but a far greater evil than this attends the use of black paint, which ought entirely to exclude its use on any work out of doors, viz. its property of absorbing heat. A black unpolished surface is the greatest absorber and radiator of heat known; while a white surface, on the other hand, is a bad absorber and radiator of the same: consequently black paint is more pernicious to the wood than white. This may, and has been proved, by innumerable experiments; but the following simple experiment may perhaps be considered worthy of notice:—Take four pieces of tin plate and place them together in pairs, having the inner surface smeared with lard so that they may adhere together; then colour one pair black, leaving the other white, and suspend them equidistant from a small iron ball made red hot: it will be found that the black surface presented to the ball absorbs the heat, and soon gets charged sufficiently to melt the lard, and the result is that the two plates immediately separate; on the other hand, the white remains firm, as the rays from the heated body are for the most part reflected by the white surface.

The foregoing experiment plainly shews, that the wood having a black surface will imbibe considerably more heat in the same temperature of climate, than if that surface was white; from which circumstance we may easily conclude, that the pores of wood of any nature will have a tendency to expand, and rend in all directions, when exposed under such circumstances, — the water of course being admitted, causes a gradual and progressive decay, which must be imperceptibly increasing from every change of weather. The remedy to so great an evil is particularly simple; viz. by using white, instead of black paint, which not only forms a better surface, but it is a preventive to the action of heat, and is more impervious to moisture. The saving of expense would also be immense, and I am convinced that men of practical experience will bear me out in my assertion.

Two striking circumstances, which have fallen under my own immediate notice, deserve mention. The first was the state of H. M. Sloop Ringdove, condemned by survey at Halifax, N. S. in the year 1828.

This brig had been on the West India station for many years. On her being found defective, and a survey called, the report was to the effect that the wood round all the fastenings was totally decayed in the wake of the black, while that in the wake of the white was as sound as ever; a striking

* From the *Transactions of the Society of Arts, &c.*

proof of the different effect of the two colours.

The next instance I shall mention relates to H. M. Ship Excellent, of 98 guns, (formerly the Boyne.)

This ship is moored east and west, by bow and stern moorings; consequently, the starboard side is always exposed to the effects of the sun, both in summer and winter. In this situation her sides were painted in the usual manner of a ship of war; viz. black and white, of which by far the greater part is black; this latter portion on the starboard side I found it impossible to keep tight; for, as often as one leak was apparently stopped, another broke out, and thus baffled the skill of all interested. In the meantime, the side not exposed to the rays of the sun remained perfectly sound. I then suggested to Mr. Kennaway (the master-caulker of her majesty's dockyard at Portsmouth), who had previously given the subject consideration, the advantage likely to be derived from altering the colour of the ship's side from black to white. Captain Hastings having approved of the alteration, the ship was painted a light drab colour where it was black before, upon which the leaks ceased, and she has now continued perfectly tight for more than twelve months; and, indeed, I can confidently state, that the ship will last as long again in her present situation, as she had begun to shrink and split to an astonishing extent when the outside surface was black, which has entirely ceased since the colour was altered.

Instances of the injurious effects of black paint on shipping generally, also on the masts, yards, boats, &c., are of daily occurrence, and decidedly point out the benefit likely to result from the substitution of the one colour for the other, and manifest advantage to be derived from its use by the maritime interest, though I am aware some may object to its use as not being shipshape. To such I have only to state, that the application of copper to ship's bottoms, and the use of chain for cables, met with the same foolish objection at the time of their introduction, since which period thousands of valuable lives, with property to a large amount, have been saved by their instrumentality.

PRESERVATION OF BODIES.

In our first number we quoted from the Medical Gazette a communication on this subject to the Editor of that Journal. We now abridge, from the same Journal, some further remarks by Dr. Babington.—In a letter to the Editor, Dr. Babington says:—

Dr. Marshall, of Glasgow, takes occasion to condemn the means recently recommended for this purpose by Dr. Rees and myself.

I shall therefore review both his process and ours, under the three following heads,—comparative expense; comparative trouble; comparative efficacy.

1. Comparative expense.—We must certainly yield to Dr. Marshall in this particular. One of his subjects cost in preparation five shillings, the other little more than two, while ours cost twelve shillings. It is usual at our hospital for eight gentlemen to engage in the dissection of one body. The expense of bearing that portion allotted to each, efficiently preserved, is eighteenpence, and when we take into consideration that the work of the student's hands may be studied for two months, instead of being allowed, in one quarter of that time, to "thaw and resolve itself into a dew," by putrefaction, we think that he will in reality be a great gainer, even in pocket, by the difference.

2. Comparative trouble.—Our method, be it remembered, consists in injecting the subject by the aorta with pyroxylic spirits, and whilst the syringe is in our hand we throw a little into the rectum, and perhaps, also, by a small aperture, into the cavity of the peritoneum. The whole process will, at the utmost, occupy a quarter of an hour. Every school of anatomy has a professed injector, and in all probability it would not take him half so long. Now what is the trouble, similarly estimated, in employing what Dr. Marshall calls a "much more simple remedy?" I will quote his words: "The body must be punctured over the whole surface with acupuncture needles, or the point of a narrow bistoury, scalpel or scissors, the punctures being made pretty closely together, and deeply over the fleshy part, and, if for a dried arterial or venous preparation, the punctures ought to be made with very fine needles, and after injection." It is not very easy to ascertain the time that would be thus consumed. But let it not be imagined that the work is now finished. I quote again: "This being done, the body is brushed over with acetic acid, sp. gr. 1048, which must be brushed into it slowly and repeatedly, so that the acid may fully penetrate the innermost parts," and further "repeating the application of the acid to the surface of the body for six or eight days, will not only preserve it free from putrefaction, but at the same time remove incipient greenness." We are thus left to conclude that, without this repetition, it would not be perfectly preserved, and consequently that the repetition is necessary. Multiply therefore the slow and repeated brushing above-mentioned by eight, and then to the product add the scalpel, narrow bistoury,

scissors, acupuncture needle, or very fine needle puncturation, and you will find a sum of trouble which, measured by time, might perhaps be fairly represented by a long summer's day. We have ceded the first point. Dr. Marshall must, in candour, allow that we have the advantage of him on the second. We now approach the third, by far the most important of the three.

3. Comparative efficacy.—Dr. Marshall on this head does not assume superiority, but contends that "his remedy" is equally efficacious as ours. We venture to differ from him, for the following reasons:—

1st, His method, besides disfiguring and destroying the skin, which is objectionable in itself, renders the body unfit for injection, so that it must be performed prior to this operation. Ours does not, for wax or any other material may be injected at any time after its adoption.

2ndly, His scalpel or bistoury incisions, "over the whole surface, pretty closely and deeply over the fleshy part," must necessarily divide, not only muscular fibre, but nervous filaments, and thus materially interfere with the prosecution of minute anatomy. The needles, it is true, are less objectionable in this respect than the cutting instruments, but their employment must be far more troublesome.

3rdly, The acetic acid turns the flesh white. "The whole of the parts into which the acid had been brushed were perfectly restored to whiteness:" our process leaves the parts of their natural colour.

4thly, An acid preparation of any kind must greatly injure the blades, and immediately destroy the edge of dissecting instruments; and acetic acid of sp. gr. 1048, would even, I should suppose, after no very long period, remove the cuticle from the dissector's fingers, that being the precise strength of the strong acid of the London Pharmacopœia as employed for cauterising warts, destroying ring-worm, &c.

[*Dr. Marshall, in a reply, assents, in nearly all respects, to Dr. Babington's statements.*]

ACTION OF GREAT FIRES PREVENTING THE FORMATION OF STORMS.

BY M. MATTENCI.

M. Mattenci had noticed the custom recently established in a parish in Romagna, of kindling great fires with this view, and remarked that during three years that this practice had been followed, the parish, previously ravished every summer by hail, had been spared, while the neighbouring parishes had not been. M. Arago thought that more legitimate conclusions might be drawn from observations made in countries where a great number of high furnaces and smelting houses are met with, as in certain parts of England; but the presence of metallic veins is a complication which necessarily interferes with the results observed. M. Mattenci on this occasion pointed out a locality in which the influence of metallic veins does not complicate that of the great fires. In travelling in the Apennines he found that the cantons in which charcoal and sulphur were manufactured never suffer by hail.

III. PHARMACY, &c.

COMPARATIVE EFFECTS OF OPIUM AND ALCOHOL.*

THE object of a paper read by Mr. Downing, was chiefly to point out the injurious effects which opium taken habitually, either by being swallowed or by inhalation, exerted upon the physical and mental energies. With this view, he advanced a great number of facts from the works of various Eastern travellers, the accuracy of whose descriptions he had been able to verify by personal observation. It is unnecessary here to give the often-repeated catalogue of evils which beset the habitual consumer of opium. With reference to the comparative effects of opium-eating and spirit drinking, the author remarked, that they resembled each other in many respects, as would at once be perceived; the points in which they differed, however, were not so perceptible to ordinary observers. They both stimulated the nervous system to an unnatural degree, and when the pleasurable sense of excitement was over, they both left a relaxation of the nervous system, and an undue depression of both the bodily and mental powers. They both disordered the digestive functions, predisposed to other diseases, and materially shortened the period of life. In order to keep up the same degree of excitement, a greater quantity of each must be used, the oftener it was indulged in; so that, if once the appetite were formed, constantly increasing indulgence was necessary, and almost

* *Report of Proceedings at the Westminster Medical Society*; from "*The Lancet*."

inevitable. The desires were the only standards for estimating quantity. They both stupified and deranged the intellectual powers, and debased the moral attributes. All the injuries inflicted by alcohol, however, the author considered were increased in a tenfold degree by the use of opium. In one, there was a limit to the quantity taken; in the other, the quantity was unlimited. The spirit drinker had some short intervals of repose; the swallower of opium none, his being a life of perpetual excitement. In one, the habit might be broken off—many a drunkard had been cured of his propensity to intoxication; but there was scarcely one known instance of escape from the toils of opium, when once they had firmly enveloped a man. Opium eating, he believed, was increasing in this country.

Dr. Johnson directed attention to the kind of intoxication produced by spirits or wine. The party were quarrelsome, bustling and noisy, so contrary to the effects which were produced by opium. When the opium smoker had taken in his whiff, he sate as still as marble for four, six, or eight hours, apparently in the deepest reverie; this was not the case with wine. With reference to the increased consumption of opium in this country, he might mention that the insurance offices had found that the sale of opium had increased in a direct ratio with the increase of teetotalism!

Mr. Snow considered that alcohol was a simple stimulant, whilst opium had two distinct properties, that of a stimulant and that of a narcotic. The effect of spirit, including wine and malt liquors, which contained it, was the opposite of that of the sedative or contra-stimulant medicines, such as digitalis, green tea, antimony, the acids and neutral salts. Opium was, undoubtedly, likewise a stimulant; he had remarked it to produce a striking effect on the heart's action in a case of delirium tremens, and the increased force of the heart was continued, during the sleep which was induced, and even afterwards. It was also a narcotic, as was proved by its well-known power of alleviating pain, and procuring sleep. That a narcotic power was quite independent of that of a stimulant, was clearly shown in hyoscyamus and conium, which, so far from being stimulants, were positively sedatives. The narcotic property of opium appeared to reside in the morphia, and the stimulating one in the narcotine. The case of an opium-eater who found hyoscyamus and conium no substitute for his opium, was interesting, as proving the difference between a stimulant and a sedative narcotic. These medicines were too apt to be prescribed, without attention to the indications which might always be gained from the pulse and heart.

Mr. Verrall considered that both the agents in question acted, first, as stimulants, and secondly, as narcotics. The feelings which predominated on the day following intoxication, by opium or morphia, were similar to those which were present when the state of inebriation had been produced by wine: opium seemed to act on the nervous system chiefly, alcohol on the vascular.

Dr. Burgess was of opinion that the habitual use of opium was more prejudicial than the constant indulgence in the use of ardent spirits. Opium-eaters were wasted, and prematurely aged.

Dr. A. T. Thomson said that all stimulants, by exhausting the nervous energy, and thereby producing sedative effects, were, necessarily, narcotics; but the difference between opium and alcohol consisted in the anodyne properties of the former, and its power of relieving pain in a part remote from that to which it was applied, a virtue which was not possessed by alcoholic liquors. Opium in large doses acted as a direct sedative, whilst alcohol in the same proportion would produce a powerful inflammatory state of the stomach; opium produced no such inflammation. Opium appeared to act upon the nervous system almost entirely; while alcohol excited the vascular system. He had known many opium-eaters, who were reduced to a species of mummies. Opium eating, he contended, shortened life, but not so decidedly as did ardent spirits, the latter producing hepatic disease more rapidly and more frequently.

ABORTION WITH SYMPTOMS OF POISONING PRODUCED BY THE USE OF RUE.*

BY M. TH. HELIE.

A young girl, of short stature, but robust constitution, who had had a difficult labour at the age of sixteen, brought on a miscarriage in the following way. She sliced three fresh roots of rue as large as her finger, and boiled them in a pound and a-half of water, down to three cupfuls, which she took in the evening at a draught. She was immediately seized with acute pain in her stomach, which was soon followed by so great and general a feeling of faintness, that she thought she was going to die; she saw every thing as through a mist, tottered, and felt giddy, as if intoxicated. Violent and continued efforts to vomit soon came on, which continued the whole night. Colick pains, at first slight, but afterwards more severe, were experienced the next day. Towards the evening of the second day they became violent, and followed one

* *Annales d'Hygiène*, vol. xx.

another in quick succession. Now small discharges of blood from the vagina, then large clots, and in a few minutes afterwards abortion took place, forty-eight hours after the decoction of rue had been swallowed, the girl not having been confined to her bed. The unpleasant symptoms caused by the rue went off in a few days.

Another case was that of a young girl who had been four or five months pregnant, but, wishing to induce abortion, took large doses of the expressed juice of fresh rue leaves for several days. The symptoms induced very much resembled those of the former cases. Somnolency, prostration of strength, fainting, slowness of pulse, coldness of skin, and jactitation of the limbs, were all observed. Swelling of the tongue, with copious salivation, was also noticed. Abortion did not take place till the sixth day from the beginning of the manifestation of the symptoms of poisoning. The symptoms of poisoning, however, lasted for twelve days, when they abated, and the girl recovered.

POISONING FROM THE EXTRACT OF ACONITE.*

The *Gazette Medicale* gives accounts of the death of two persons, and of the serious illness of several others, in consequence of their having been taking an alcoholic extract of the Aconitum napellus, for the cure of rheumatic pains, of much stronger powers than that which had been previously administered, although the doses had not been increased in quantity.

The facts stated sufficiently point out the necessity of the greatest caution in the administration of poisonous vegetable extracts from different parcels or quantities prepared at different times, and perhaps under different circumstances. The physician will act wisely to diminish the dose of such drugs, whenever a fresh parcel or quantity is used for the first time.

POISONOUS SYMPTOMS FROM THE BITE OF A SPIDER.†

BY DR. HULSE.

On the 7th of August, a gentleman, when in the water-closet, received a bite from a spider on the penis. The pain, which was not great at the moment, continued to increase in severity till an hour afterwards, when it became so intense that Dr. Hulse was sent for. The patient was found writhing under the most acute suffering, though the seat of the bite showed no marks of irritation or swelling. Very shortly afterwards, violent vomiting came on, attended with deep-seated pain in the region of the abdomen, extending to the chest, and with occasional convulsive paroxysms of suffocation. The vessels of the face and neck were greatly distended, and of a dark hue. Blood was abstracted freely from the arm, and teaspoonful doses of laudanum and *aqua ammoniæ* were given every ten minutes, but almost immediately ejected from the stomach. Spasm of the muscles of the spine and of the extremities now came on, and the agony and anxiety were much increased. Tincture of cantharides, strong ammonia liniment, and spirits of turpentine, were applied to every part of the body; and the ammonia and laudanum, with the addition of some tincture of camphor, were administered internally. Three hours after the accident, the paroxysms of pain came on at longer intervals, and the vomiting was less urgent, but the intensity of the pain during the paroxysm was undiminished. Frequent injections had been given, but it was not till five hours after the accident that feculent matters were passed. The patient became much easier in the course of the evening, and a dose of castor oil was retained on the stomach, which purged him freely. The pains in the legs, however, continued, and prevented sleep. Sinapisms were next day applied without relief. Veins in both feet were therefore opened, and blood was allowed to flow till an impression was made on the pulse. The pains left about an hour after this; he passed a quiet night, and rapidly recovered.

The spiders in the water-closet were of a large size, of a dark-brown colour, and covered with hairs over the body and legs.

STATISTICS OF POISONING IN ENGLAND.‡

The following digest is taken from a Parliamentary document, entitled, "Returns from the Coroners of England and Wales, of all Inquisitions held by them during the years 1837 and 1838, in cases where Death was found, by Verdict of Jury, to have been caused by Poison."

Arsenic.-	184
Taken by a girl disappointed in love	1
By a girl, in a fit of passion	1
By a girl, in a fit of jealousy	1
By a girl, who had robbed her master's son	1

* *Gazette Medicale.*

† *American Journal of the Medical Sciences*, May 1839.

‡ From *The Lancet.*

By a girl, seduced and deserted by a married man 1
By a girl, subject to fits of despondency 1
By pregnant girls, to destroy themselves 5
By a pregnant girl, to procure abortion 1
By a pregnant girl, deserted by her lover, who was suspected to have procured her the poison 1
By a pregnant girl, how or by whom administered not known 1
By a wife, separated from her husband 1
By a young woman, married unhappily, and separated from her husband 1
By a cook maid, distressed by the death of a friend 1
By an insane mother and two children, administered by the former 3
By five children, to whom it was administered by an insane mother .. 5
By a man, embarrassed by debt, and disordered in mind and body 1
By men, through reduced circumstances, pecuniary embarrassments, &c. 6
Taken through drunkenness 12
By a farmer and innkeeper, who, having had a handsome legacy left to him, spent it in riotous living, got into debt, and took poison to escape his creditors 1
Through poverty 3
Through despondency 1
In lunacy 52
In food, by accident 7
In mistake, by young people, in food prepared for vermin 5
In mistake, by a married woman, who, having mixed it with oatmeal for vermin, was innocently supplied by her husband with food prepared from the mixture 1
By accident, the deceased having tobacco and arsenic loose in the same pocket 1
In mistake for cream of sulphur 1
Administered to a child in mistake for magnesia 1
——— Queen's cordial 1
Taken inadvertently in various ways 3
Administered wilfully 5
How administered not known 2
Felo de se 23
Taken without cause assigned in the report 36
Opium 42
Overdose, taken by adults in ignorance 11
Overdose, administered to children, by mothers and nurses 8
Administered to a child, in mistake for other medicine 1
Supplied by a deaf druggist for manna, and administered to a child by an ignorant nurse 1
Administered to a child found dead in the Trent, extensively bruised (the poison and the wounds both sufficient to account for death) .. 1
Taken by a child in ignorance 1
Taken through drunkenness 2
Through lunacy 9
How administered not known 1
Felo de se 2
Taken without cause assigned, &c... 5
Laudanum 133
Administered by mistake 2
——— for antimonial wine 1
——— for paregoric 2
——— for Godfrey's cordial 2
——— for syrup of buckthorn 1
——— for tincture of rhubarb 4
Sold at a druggist's for antimonial wine—the druggist not bred to his trade, and kept two shop-girls, one of whom (the coroner ascertained) gave twice as much laudanum for a penny as the other 1
Taken by adults as medicine 11
An overdose, taken by a drunken surgeon 1
Taken by mistake for a surgeon's draught 1
Administered to children in mistake 2
Drunk by a child, within whose reach the phial had been left 1
Given by a child to an infant, to allay coughing, in the mother's absence 1
Overdose to infants, by mothers and nurses 26
Taken inadvertently 7
Through despondency 4
Through drunkenness 9
Through dissolute conduct 1
Through lunacy induced by want .. 2
Through do., from various causes ..30
Through loss of situation 1
Wilfully administered 2
How administered not known 2
Felo de se 4
No cause assigned, &c. 14
Cough Syrup 1
Overdose, given by a mother to her child 1
Syrup of Poppies 5
Overdose, administered to children by mothers and nurses 5
Godfrey's Cordial 12
Overdose, administered to children by mothers and nurses 10
Administered to children by mistake for syrup of rhubarb 2
Infant's Mixture (most probably a preparation of Opium) 1

Overdose given by a mother to her child 1
Morison's Pills 1
Taken as medicine 1
Tartar Emetic 2
Three drachms, taken to cure the ague 1
Overdose, given to an infant 1
Colchicum 3
Overdose, taken for the gout 1
Taken as medicine 2
Mixture for Vermin 2
Taken by children, within whose reach it was left 2
Hellebore.....1
Taken by a "temporary lunatic" .. 1
Mercury 2
Taken by a "temporary lunatic" .. 1
Felo de se 1
Bichromate of Potash 1
Eaten ignorantly by a child..... 1
Aqua fortis.....2
Drunk by a child, within whose reach it was left 1
Taken in temporary lunacy..... 1
Oxalic Acid 19
Taken by a woman who had quarrelled with her husband 1
By a person of defective intellect .. 1
Through lunacy 8
Through drunkenness 1
Through want of employment..... 1
By a young woman, on the emigration of her brother 1
By a child, within whose reach it was left 1
Without cause assigned 5
*** It is singular, that nearly the whole of the cases of poisoning by oxalic acid occurred in Middlesex.
Nitrate of Silver 1
By a child (swallowed percussion caps) 1
Castor Oil Seeds.....1
Taken inadvertently 1
Fungus.....4
Eaten for mushrooms 4
Rum.....1
Ignorantly given to a child for inflammation of the bowels..... 1
Extract of Lead 1
Found in solution by a woman, and given to her child in mistake for ginger-wine 1
Essential Oil of Almonds 4
Taken in lunacy 2
Without cause assigned 2
Prussic Acid and Arsenic 1
Taken in lunacy 1
Arsenious Acid 1
Taken in mistake for a purging powder 1
Acetate of Morphine 2
Administered in mistake for other medicine 2
Strychnine (the active principle of Nux Vomica).....2
Taken by a child, to whose father it had been sent as a medicine 1
Lunacy 1
Nux Vomica 3
Taken in ignorance of its effects.... 1
Procured by a girl of weak intellect, and given to her father, who had sent her for an emetic 1
Taken without cause assigned..... 1
Wolf's Bane 1
Eaten by a child, who found it in his father's garden 1
Black Ashes..... 1
Procured for washing, and eaten by a child 1
Sulphate of Iron (Copperas) 1
Taken to procure abortion 1
A Vegetable Poison 3
Taken by two children (brothers) .. 2
By an adult 1
Hicrapicra.....1
An overdose, taken in gin 1
Monk's Hood 1
Gathered by a poor old man, and eaten in mistake for celery..... 1
Savine 1
Taken to procure abortion 1
Infusion of Hemlock 1
Overdose, taken by a woman 1
Laudanum and Prussic Acid 1
A case of lunacy 1
Potash.....1
Taken by a child 1
Medicine.....1
Administered to an infant—intended for an adult 1
Muriate of Tin 1
Taken by a child in mistake for vinegar 1
Cantharides.....1
An embrocation, containing tincture of cantharides, administered to a child in mistake 1
Laudanum and Aquafortis 1
Lunacy 1
Carburetted Hydrogen Gas 2
Inhaled during sleep, through an accidental escape of gas 2
Belladonna (Deadly Nightshade) 2
Taken by mistake 1
Without cause assigned 1
Paregoric Elixir 2
Overdose, administered to children 2
Decoction (nature not exactly known)....1
Taken by a pregnant girl, with the supposed intention to procure abortion 1
Nitrous Acid, with Aloes 1
Taken without cause assigned..... 1
Cayenne Pepper, &c. 1

Cayenne pepper, essential oil of Cayenne, and bark, taken in alcohol, as a remedy for the ague 1
Turpeth Mineral 1
Taken in mistake 1
Sulphuric Acid (Vitriol) 32
Swallowed by children, ignorantly.. 9
——— for ginger beer..... 3
Administered to children for Godfrey's cordial..... 4
——— a child for castor oil 1
——— for syrup of rhubarb 1
——— for some medicine not named 1
Accidentally sold for Godfrey's cordial, and given as such to a child 1
In a drunken fit 1
Through insanity 5
Through family quarrels 1
By a woman, who thought herself forsaken by God 1
Without cause assigned 4
Hydrocyanic (Prussic) Acid 27
Taken by surgeons, depressed in mind by reduced circumstances .. 2
By a surgeon delirious from scarlet fever 1
By a surgeon, addicted to drinking 1
By a surgeon, in a fit of frenzy 1
By druggists, deranged 2
By a medical student, affected by over-study 1
By a child, in ignorance 1
By a gentleman, reduced from affluence to poverty, and deranged .. 1
Through disappointment in love .. 1
Through lunacy 2
Without cause assigned 6
Corrosive Sublimate 12
Taken incautiously as medicine 1
By mistake, for cider 1
In a fit of passion..... 1
Through despondency..... 1
Through lunacy 5
Felo de se 2
Without cause assigned 1
Poisons not specified 14
Taken accidentally 12
By a drunkard, in mistake 1
Case of miscarriage, the mother having received some noxious drug .. 1

Gateshead Observer.

STATISTICS OF POISONING IN DENMARK.*

Ninety-nine cases of poisoning occurred in Denmark from 1830 to 1835; sixteen by arsenic, seventy-four by sulphuric or nitric acid (generally diluted), four by caustic potash, one by an undetermined caustic, two by opium, one by litharge, and one by verdigris.

Of the sixteen cases in which arsenic was taken, four were suicidal; in three it was intentionally given by others; in three it was taken by mistake; and in six it was uncertain whether it had been taken by mistake or not. In one case an arsenical ointment, which had been intended for a different purpose, was used for poisoning. Of the seventy-four cases of poisoning by sulphuric or nitric acid, fifty-seven occurred in Copenhagen, and seventeen in the provinces. Among the latter, suicide was attempted or effected in thirteen instances; twice, the poison was given by others; and thrice, the poisoning occurred through a mistake. The two cases of poisoning by opium were both suicidal; one was an apothecary's apprentice, and the other an hysterical woman, for whom laudanum had been prescribed as a remedy.

The case of poisoning by litharge, occurred through mistake; but it is to be observed that symptoms of poisoning by litharge have hitherto not been uncommon in Denmark, as the peasants use it to sweeten their sour beer. In 1838, three such cases though not fatal ones, occurred near Friedrichsburg, so that the public has become aware of the injuriousness of the practice, and measures have been taken to prevent it by law. The case of poisoning by verdigris was caused by a solution in brandy. It was uncertain, however, whether the symptoms had been caused by the trifling quantity of verdigris which was found, or by great errors in diet. The cases of poisoning by caustic occurred through mistake.

* *Zeitschrift für die gesammte Medicin.*

DETECTION OF ARSENIC IN THE BLOOD, FLESH, AND VISCERA, AFTER DEATH FROM POISONING.†

M. Orfila, to determine whether the presence of arsenic can be detected in the blood and the solid parts of the body after death, in cases of fatal poisoning, has proposed a new process, which he deems to be a great improvement on the former one.

Take the liver, spleen, lungs, or a certain quantity of the blood of the animal that has been poisoned with arsenic, and dry them thoroughly. The dried mass is then to be treated in the heat with concentrated and purified nitric acid; in the course of a quarter of an hour or so, the whole mass will be dissolved. The liquor is concentrated; a dark point appears, and soon the carbonization is complete. It is then to be treated with cold water. The solution is introduced into Marsh's apparatus, and submitted to the hydrogen test.

† *Memoires de l'Academie.*

In performing the experiments, we must carefully be upon our guard not to raise the temperature of the mixture too high, and also not to use too large a proportion of nitric acid. If more than sufficient be used, the flame is too vehement, and almost all the arsenic will be destroyed. Again, if the heat applied be not sufficient, the carbonization is not complete, and a disagreeable pyrogenous odour, similar to that of burnt horn, is emitted. Several hours are required for the experiment; and sometimes, even with the greatest care and dexterity in performing it, a portion of the arsenic is lost.

The following are the proportions of nitric acid recommended by M. Orfila, to be used with the different parts of the body submitted to the experiment. For three ounces of dried blood, seven ounces of the acid are required; for one ounce of dried gelatine, one ounce of acid; for three ounces of the residue obtained by decoction of the limbs, nine ounces of acid; for six ounces of dried cerebral matter, four ounces of acid; and for all adipose matters, a very large proportional quantity of the acid is necessary. Twelve ounces of dried liver require thirty-four ounces of acid; whereas twenty-two ounces of muscle require only sixteen ounces.

By following the proportions now given, provided at the same time care has been used in effectually drying the substances submitted to experiment, we are sure almost of constant success. We may not indeed succeed in recovering all the poison, but much less will be lost in this than in any other way.

THE OXIDES OF IRON AS ANTIDOTES OF ARSENIC.*

M. Bunsen proposed the hydrated peroxyde of iron in a moist state as an antidote to arsenical poisoning; and the value of the remedy has been confirmed by several other experimenters. As the compound formed by the union of the two metallic salts is quite insoluble and inert, there is every reason to believe that, if a complete union could take place in the stomach when the poison has been swallowed, and before it has produced its deleterious effects, many lives might be saved. The only objection against the moist peroxyde is the tediousness of preparing it, its inconvenient bulk, and the difficulty of keeping it for a length of time. The mode of preparing it is by peroxydising a solution of sulphate of iron by the means of nitric acid with the aid of heat, and then adding pure liquor ammoniæ: the supernatant liquor is to be drawn off the flocculent precipitated peroxyde; and fresh water must be poured on it, and decanted off several successive times. The process requires four or five hours.

A committee was recently appointed by the Society of Medicine to examine the subject in all its details, and to endeavour to discover a substitute for the moist peroxyde recommended by M. Bunsen. The report of this committee says:—We do not hesitate to assert that the effects of the arsenious acid are successfully opposed, not only by the moist peroxyde of iron proposed by M. Bunsen, but still more effectually and more easily at the same time by the dry hydrated peroxyde—the subcarbonate of iron of the chemists. This is readily prepared by precipitating the proto-sulphate of the metal by carbonate of potash, and washing the precipitate repeatedly. By exposing it freely to the air during desiccation, it becomes completely oxydated, loses its carbonic acid, and is then in short a dry hydrated peroxyde:—100 drachms of this precipitate, when calcined, yield 69 drachms of an anhydrous peroxyde.

In numerous experiments performed by the reporters, its antidotal efficacy was very remarkable when the dose of the poison had not exceeded four or six grains. The first thing to be done is to encourage vomiting as freely as possible. But in doing this, the patient should be made to drink copiously of milk or of oil, and not of water, to prevent the further solution of the poison. Whenever the vomiting is carried as far as is deemed adviseable, a quantity of lukewarm water, in which several ounces of the dry peroxyde of iron are suspended, should be administered. If it is rejected by vomiting, so much the better; we have only to repeat the dose immediately.

The committee suggest that half an ounce of the dry peroxyde should be given for every grain of the arsenic that may be in the stomach.

It is mentioned in the report that *small doses of arsenic*, say four or six grains, *proved more quickly fatal than larger ones*, as from 12 to 40 grains. The absorption seems to go on more rapidly when the dose is small.

HYDRATED PEROXIDE OF IRON AN ANTIDOTE TO ARSENIOUS ACID.*

A young lady, disappointed in love, resolved on suicide. She took a packet of

* *Revue Medicale, as quoted in the Medico-Chirurgical Review.*

† *American Journal of the Medical Sciences*, May 1839.

arsenic containing two drachms, put it into a silver vessel, poured over it about two ounces of water, and drank the fluid contents. This was about midnight. She then went to bed; but finding death not approaching, she took some of the poison which remained at the bottom of the vessel, and endeavoured to push it down her throat, but its bitter taste, she said, made her spit out a part of it. She must, however, have taken about fifty-six grains of arsenious acid. At one in the morning, the first symptoms of poisoning manifested themselves by several attempts at vomiting and by a feeling of burning heat in the throat and in the region of the stomach. It appeared that the patient had that day ate a hearty dinner, the digestion of which had not apparently been finished, as the vomiting brought up a portion of it, and probably also some of the poison. The pain soon became violent, followed by cramps in the calves of the legs.

Dr. Deville saw the patient at four o'clock in the morning. She had vomited three or four times; she had intense frontal headach, and her face was much flushed; her eyes were greatly swollen, and filled with tears; and she complained of a feeling of suffocation, and also of acute burning pain in the throat and stomach. Her pulse was strong, full, and bounding. Dr. Deville thought he had arrived too late to render effectual assistance, and gave only some milk and other drinks to aid the vomiting, and applied a poultice over the region of the stomach.

The symptoms progressively increased in intensity, and Dr. Delons was sent for, who proposed to give the hydrated tritoxide of iron. This medicine was procured by half-past five, five hours and a-half after the taking of the poison. It was given in ounce doses about every quarter of an hour, till eight o'clock, by which time nearly half-a pound had been taken. It was then discontinued, as it had produced vomiting several times, and had purged twice, and as the symptoms appeared to be abating. She still, however, suffered from violent cramps, particularly in the left leg. The pulse still continued full and bounding; the pains in the epigastrium were at times insupportable, and then again almost disappeared. Twenty-five leeches were applied over the stomach, followed by cataplasms; and emollient injections were administered at intervals.

Feverish symptoms, with violent headach, continued for this and several succeeding days, preventing the patient from enjoying a moment's repose. The pain in the epigastric region, however, diminished under the use of warm baths and soothing treatment; and at the end of eleven days she had completely recovered.

UVULARIA PERFOLIATA, AN ANTIDOTE FOR POISONED WOUNDS.*

BY B. H. COATES, M.D.

The *Uvularia perfoliata*, *Hieracium nervosum* (*venosum*), and several other plants are in common use among the American Indians as antidotes to the poisonous symptoms produced by wounds inflicted by the poisonous snakes.

Dr. Coates relates in detail a case of the efficacy of the *Uvularia* applied topically to the wounds inflicted by a copper-head (*Trigonocephalus contortrix*), one of the most poisonous of the American snakes. Immediately after the bite, which was situate about two inches above the instep, a ligature was applied firmly above the knee, and a quantity of the *Uvularia perfoliata* bruised with vinegar and salt, was applied over the seat of the bite. The wound, which was at first intensely painful, became soon after quite free from pain unless when touched. The limb was quite benumbed, and was enormously distended with œdematous swelling as high as the ligature; masses of effused blood were visible over the top of the foot and in several parts of the leg; the skin was white, shining, and cold. Suction was afterwards made over the bite for about half an hour with a tobacco pipe, and ammonia was administered internally. The ligature was continued for nearly thirty hours, when symptoms of threatening mortification of the limb caused it to be removed. The child, a girl about five years of age, was then freely purged, when the swelling rapidly abated, and three days afterwards she was running about as usual.

Dr. Coates is of opinion that "death rarely, if ever, takes place from the direct effects of the bite in human adults. Thus, that which had been ascertained by Fontana with so much labour in regard to the viper, and rendered so probable by Russell, as to the *Cobra di capello*, and other Indian serpents, seems also to be established in regard to our rattlesnakes."

Dr. Coates remarks, that the appropriate treatment is "a moderately tight ligature, and suction with some force for a prolonged period;" and he is of opinion it would be sufficient if these were continued for a period of six or seven hours. He thinks it would be right to make still further trials of antidotes, though the facts above related go far to explain the cause of the doubtful reputation of the various remedies for the bites of poisonous serpents.

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* *American Journal of Science*, vol. xxxv. 1839.

TOXICOLOGICAL MISTAKES.*

Many substances prove poisonous, which are not commonly supposed to be so.

Lately in the North of England, a girl died in consequence of having taken more than half a pound of *common salt* as a cure for worms. This is not unprecedented; for in September 1828, a man in London having undertaken to swallow a pound of salt with a pint of ale, performed the feat, but was seized with the symptoms of irritant poisoning, and died within twenty-four hours. The stomach and intestines were excessively inflamed.†

Dr. Christison enumerates several other substances, which though not commonly reputed poisons, have proved so in reality. The *sulphate of iron* is one of these. A girl having taken an ounce in beer was seized with cholic pains, vomiting, and purging, that was cured by mucilaginous and oily drinks. In a document headed "Deaths from Poison,‡" one death is put down to sulphate of iron; but it is merely stated that it was taken to procure abortion, and no account is given of the symptoms.

In another case, a large *quantity of pepper* (from an ounce and a half to two ounces) produced a gastritis, from which, however, the patient recovered.

Even *Epsom salts* appear to have caused death. A boy, ten years old, took two ounces, and had hardly swallowed the medicine before he was observed to stagger and become unwell; and in forty minutes more he was dead.‡ The dose was certainly too large; and as the boy was probably weakly (being supposed by his father to labour under worms), some hypercartharsis might reasonably have been expected; but as there was no purging or vomiting, the immediate prostration of nervous energy in this case would seem rather to have been an accidental coincidence than a result of the medicine;—yet it is just possible that in this unique case the irritability of the stomach was so exquisite that even the stimulus of Epsom salts was unbearable.

A man who was employed in Morison's pill manufactory, having got drunk on a Monday, endeavoured to cool his stomach the next day by taking an enormous quantity of *cream of tartar*, and died on the Thursday. The quantity taken is uncertain: the patient himself merely said that he had swallowed four or five table-spoonfuls. This would be only four or five ounces, unless we suppose heaped measure to be intended. Both the stomach and bowels were much inflamed. In this instance, the gastritis caused by the liquor seems to have been fatally aggravated by the bitartrate of potash; so that the unfortunate patient fell a victim to the joint action of the poison, and of what he imagined to be the antidote;—for it is clear that spirituous drinks, when in large quantities, or not sufficiently diluted, must be reckoned among the poisons of which we are now speaking—among those, namely, which may destroy life with rapidity, though not popularly supposed to possess this power. Among the more remarkable observations made by Dr. Beaumont, on the digestion of Martin, the Canadian hunter, he found that after hard drinking his stomach was not only inflamed but ulcerated.

Tobacco, again, is a substance which, though well known to every practitioner of physic to be poisonous, is used without caution by the public. Sometimes its dangerous powers, both acrid and narcotic, are seen when it is administered by the practical joker, as when Santeuil, the French poet, was poisoned by snuff put into his wine; and sometimes when it is given by quacks, or used as a domestic remedy. Thus Beck mentions a case where a woman, being persuaded by an empiric to use an infusion of tobacco as a clyster, to cure worms, was seized with convulsions, and died in a quarter of an hour. And Dr. Merriman informs us, in his notes on Underwood, that "a case of stupor, ending in death, occurred a few years ago, at Shoreditch, from the incautious manner in which a father washed the head of his child with a strong decoction of tobacco, for the cure of tinea."

Yet tobacco is daily smoked by countless thousands, without any immediate bad effect, except giddiness and vomiting in beginners; and this impunity makes the hasty conclude that the weed may be employed in every way, without caution; just as the use of the chloride of sodium at our table produces the mistaken conviction that it may be harmlessly swallowed in any quantity.

Camphor is often supposed by the uninstructed to be perfectly innocuous, though a scruple is a large dose, and forty grains a dangerous one. The error possibly arises from the frequent use of camphor mixture, which smells very strongly of the drug, though it contain so little.

In the Abstract of Coroners' Inquests above-mentioned, one death is set to *Hiera picra* (an aloetic powder) in gin; and one to cayenne pepper, essential oil of cayenne, and bark, taken in alcohol, as a remedy for the ague. In both these instances it is fair to suppose that the doses were excessively large; though the essential oil of cayenne

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* *From the Medical Gazette.*

† Christison on Poisoning, p. 491.

‡ Compiled from a report entitled "Returns from the Coroners of England and Wales."

would require to be doled out with a very frugal hand.

There is another class of remedies—that of opium and its preparations, where mistakes are easily fatal, yet which are constantly given without medical advice. What is the consequence? Let the Abstract answer the question. It contains an account of 543 cases of poisoning. Among these, 11 were instances where adults took an overdose of opium from ignorance, and the same number where laudanum was taken as a medicine: besides two cases where it was given for paregoric elixir; four for tincture of rhubarb; one for syrup of buckthorn, &c. But there are no less than 72 cases where children were killed by overdoses of opium or its preparations, and from its being given by mistake for other remedies. In the first place, doses large enough to kill adults are administered by the stupid, or the drunken; secondly, the multitude are not usually aware how small a dose of opium will extinguish the slender flame of infant life; and thirdly, Godfrey's cordial, Dalby's carminative, and other soporific mixtures, are given to children without hesitation, and perhaps without suspicion of their being opiates. In the abstract, ten deaths are put down to over-doses of Godfrey's Cordial administered to children by mothers and nurses, besides four cases where it was given by mistakes instead of syrup of rhubarb. But in addition, the coroner of Nottingham states, that "Godfrey's Cordial is given to children to a great extent; and that he has no doubt whatever that many infants are yearly destroyed in that borough, but who, dying off gradually, never came under his care officially."

If such effects are produced by the abuse of opium, what would happen if the laity were to deal out the refinement of modern chemistry with their rude hands? In truth, we would recommend even practitioners of physic, when inclined to prescribe strychnia, or veratria, to remember the advice of the College, "viribus hæc induta violentis, haud temerè adhibenda est."

VALUE OF THE SIGNS OF DEATH BY HANGING.*

BY M. ORFILA.

M. Orfila, in consequence of the assertion of M. Devergie, that death by hanging could always be detected by the circumstance of spermatic animals being found in the urethra, and by the genital organs being congested with blood, made a number of experiments to determine this point. He found that in almost every dead body, no matter from what cause death resulted, spermatic animals were observable in the urethra; and in many cases they were found to be alive even six hours after death. In the living body, again, he detected spermatic animalculæ in the first urine which was passed after seminal emission, although even twelve hours had elapsed between the seminal emission and the passing of the urine.

With regard to the congested state of the genital organs, which is alone produced, according to M. Devergie, when death results from hanging, M. Orfila found, that hanging up a dead body several hours after death would always to a greater or lesser extent produce this congestion. In one of the cases which he relates, the person had died of disease of the heart, and though the body was not hung up till five hours after death, the penis was by this change of posture increased in diameter by nine lines, and actualy became so erected as to form a right angle with the body.

He concludes, therefore, that no faith can be put in the presence of spermatic animalculæ in the urethra, or in congestion of the genital organs, as signs of death by hanging.

* *Annales d'Hygiène Publique*, October, 1839.

DETECTION OF THE SPERMATIC ANIMALCULÆ.†

Dr. Bayard has, within the last year or two, followed out the suggestions of M. Orfila as to the evidence which might be derived from the microscopical examination of spermatic stains in certain medico-legal enquiries, and he has been enabled to correct the erroneous and unfavourable conclusion to which this distinguished physician had arrived.

By simply moistening the linen in water, contained in a watch-glass, for several hours and then heating it gently with a spirit-lamp, he succeeded in detecting the dead animalculæ without any difficulty. Along with these animalculæ may usually be observed some prostatic *monades:* these have a globular form and are without tails, and they are considerably larger than the genuine *zoospermes* or spermatic animalculæ, which, it is well known, have tails, and very much resemble in shape miniature tadpoles. The most important caution in conducting the above experiment is to avoid in any way bruising the animalculæ by rubbing or squeezing the linen. When this has been macerated for a sufficient length of time, Dr. B. sometimes filters the fluid, and thus procures all the solid matter on the surface of the filtering paper. He then takes a

† *Annales d'Hygiène Publique.*

small portion of this and drops a little alcoholised or ammoniated water upon it for the purpose of dissolving its mucous portion, and of detaching the zoospermes from its surface: if any fatty matter is present, a few drops of etherialized water should be used. At the bottom of the fluid thus obtained, a deposit will quickly be perceived: of this a few drops may be sucked up by means of a small tube and placed on the object-glass of a microscope which magnifies 400 or 600 times.

When thus examined, we usually perceive between the plates of glass several spots of a greasy aspect; it is in these spots that the animalculæ are generally observed. In other points we may notice numerous corpuscles suspended in the fluid, and perhaps also several of the animalculæ floating freely about.

There is another method that may be followed. A few drops of the fluid may be placed on a portion of glass and allowed to become dry; if it is now subjected to examination with the microscope, the zoospermes will be generally very easily detected.

Dr. Bayard, after giving a most minute account of the numerous experiments which he has performed; sums up the results of his observations in the following category of conclusions:

1. The spermatic animalculæ retain their life and movements, as long as the mucus, in which they are suspended, remains fluid and warm. He has found them alive during ten hours.

2. The semen, if allowed to become dry and then moistened, swells up and gradually diffuses itself in the fluid — the diffusion being more complete if gentle warmth be applied. By means of a powerful microscope the animalculæ, characterised by their long tails, may then be readily discovered.

3. To detect the spermatic animalculæ in spots upon linen, &c. we must take great care that it be not rubbed or squeezed either before or after maceration. By filtering the fluid of maceration, and then examining the deposit that remains on the filter we can generally detect the spermatic animalculæ uninjured, and with their bodies and tails perfect.

4. The presence of the animalculæ may be discovered in the mucus of the vagina, (provided the woman has no morbid discharge) for many hours after sexual intercourse.

5. Dr. Bayard says that he has been able to recognise the presence of the animalculæ *à longue queue*, entire and complete in every respect, on spermatic stains of from two to upwards of twelve months old.

TRANSMISSION OF VACCINE LYMPH BY THE PENNY POST.

To the Editor.

Sir—An official notification having appeared, that from and after the 10th of January, the Penny-postage system is to come into operation, I crave a small space in your valuable Journal, that I may inform your country readers that all applications for Vaccine Lymph, addressed after that day to the resident Surgeon at the Small Pox Hospital, London, shall receive the earliest possible attention.

The effect of this new system of postage, in bringing to the door of every medical man throughout the country a supply of Vaccine Lymph, *from various sources*, at the small charge of one penny, cannot but have a most remarkable effect upon the practice of Vaccination. I stated this very strongly to the Committee of the House of Commons, appointed to investigate the Post Office Question, and I now confidently look forward to the most favourable results. I am, Sir, your obedient servant,

GEORGE GREGORY.

31, Weymouth-street, Dec. 28, 1839.

INOCULATION OF A LEPER WITH VARIOLA.

BY M. GUYON.

M. Guyon wrote to M. Flourens that he had performed this operation with success upon a Kabyle leper, from the mountains of Bongia. Although the parts upon which he operated were deprived of all sensibility, the disease followed the most regular course; after a local eruption remarkable for the developement of pustules, the most benign variola appeared upon the trunk and members.

ON BLISTERS.

BY M. TROUSSEAU.

In a letter addressed to his master, Dr. Bretonneau, the learned professor, after having spiritedly criticised those physicians who, always lost in the depths of nebulous and inapplicable theories, neglect the ordinary but useful details which often ensure the health of the diseased, gives to his brethren some remarks upon the various methods of applying blisters, which he has judged better than those commonly practised. We extract from his letter that which we think useful to be known by apothecaries.

THE BLISTER OF BRETONNEAU.

To prepare this blister, oil is mixed with the powder of cantharides, in such a man-

ner as to give it the consistence of an electuary. A sheet of paper is then taken, in which is cut an aperture of the size and form to be given to the blister; this sheet of paper is then stuck upon a piece of adhesive oilcloth, afterwards, with a spatula, is spread in the circle formed by the sheet of paper, a layer of the epispastic mixture, of which the thickness should not exceed one or two millimeters; the sheet of paper is then raised, and in this manner the pomade remains upon the oilcloth, without superfluity and accurately circumscribed.

The cantharides are then covered with a piece of blotting-paper, which extends beyond them, and adheres to the oil-cloth. The oil-paper, impregnated with cantharidine, penetrating the blotting-paper, comes in contact with the skin, and these blisters join, to an extreme activity, all desirable cleanliness.

BLISTERS OF MR. JOHNSON.

Mr. Johnson takes the English blistering plaster of the Pharmacopœia, and when it is spread he rubs over it a light layer of the oil of cantharides in ether.

This oil is that which serves for the confection of blistering taffety; it is prepared in the following manner, according to the new Pharmacopœia.

Powder of cantharides, 1000 gram. 2 liv.

Sulphuric ether, a sufficient quantity.

Make an etherial tincture of cantharides by lixiviation in a movable apparatus; distil this tincture to drive off the ether; you will obtain from it a green, thick, and very vesicant oil.

Blisters thus prepared are very active; but Mr. Trousseau prefers the following to them:—

BLISTERS OF M. TROUSSEAU.

A piece of blotting-paper is cut of the form and size of the blister that is desired; it is applied upon a sheet of diachylon; and it imbibes some drops of the extract of cantharides by ether, and it is fixed upon the skin by means of the diachylon.

M. Trousseau has tried comparatively the action of different blisters; he has found that that which is prepared with the etherial extract of cantharides was the most energetic; the blisters of Bretonneau came next before the ordinary blister, and even the English one.

Another advantage which M. Trousseau found in his blister, is that of being very portable. "Indeed," says he, "I have lightly imbibed with the etherial extract of cantharides a sheet of blotting-paper, which I have kept in the dressing apparatus of the hospital in the open air for fifteen days. The time having expired, I examined it; on its surface were seen small silky needles of cantharidine; I applied a blister cut from this sheet; it took effect at the end of eight hours. You will easily agree, that for our brethren who practise in the country, and who are obliged to carry medicaments with them, it will be especially convenient to have in a pocket-book, and under cover, a large sheet of cantharidised blotting-paper, from which will be cut blisters as large as may be desired."

These blisters have acted in the space of from six to nine hours upon two women, and from seven to twelve hours upon ten men. The mean has been from eight to nine hours.

CASE OF POISONING BY NUX VOMICA.*

By R. DUNDAS THOMSON, M.D.

THIS case formed the subject of an inquest before the late Mr. Stirling. A young girl, named Sarah Crabbe, was brought in a coach to the University College Hospital. Her head hung down when seated on a chair; the face was pale; the eyes open and bright; the arms flexible. On feeling the pulse, Mr. Taylor pronounced, to the surprise of those around, that the body was lifeless. The cheeks, from an ashy paleness, became, two or three days after, of the natural florid colour. It appeared, in evidence, that the deceased had only been in the service of her master, a penmaker, a few days; she was then 18 years old, in excellent health, and very cheerful. About the middle of the week she applied to her master for some article wanted in the house: as she did not return, his wife missed her at a quarter before nine. After this hour no tidings were heard of her till half-past seven in the evening, when her father in law, who said he was a distant relation, called with another respectable man, and examined the drawers in the kitchen. Among other things a powder was found, said to be burnt alum, a tumbler washed out with soap suds, and a pail in which she had vomited a greenish-yellow matter, quite different to anything seen in common sickness. The deceased had stated to a little girl, a cousin of her master, that on the previous day, before breakfast, she had mixed up some sugar of lead to do her gown with, and had swallowed it because she was thirsty. It appeared from the evidence further adduced, that she had formed an attachment to a young man at Dartford, who rather slighted her. Three weeks before, she left her mother's house smartly dressed, had a new pair of boots on, and, without telling any one, walked all the way to Dartford to ascertain the cause of her

From "*The Lancet.*"

sweetheart's silence. He was not prepared for the visit, procured a bed for her at a respectable inn, and sent her off, by a cart going to town, at 6 o'clock the next morning. A nurse, who gave her evidence, stated that she had known the young woman nine months. She came to witness's house, in Camden-terrace, at 10 o'clock; was very gay and cheerful; stopped the afternoon; said she came to take a cup of tea; talked over her future prospects; expected to be married very soon, and to go into business with a young man living in the country. About 4 o'clock she said, "I'll fetch some milk, nurse." She returned with it; they drank tea: about 5 o'clock the nurse went to fetch in some clothes drying in the yard; on returning, the young woman was seated in a chair; the nurse said, "Why, Sarah, you appear drowsy." She answered, "I am," and then exclaimed, "Oh dear, how ill I am; I have taken poison." She had got it, she said, from the chemist's just by. The chemist admitted he had sold her a pennyworth of nux vomica, a little while before, to kill rats. On going back from the chemist's, the nurse found her very ill indeed; left the landlady of the house to take care of her, and, after calling on four surgeons, found one who came to see her, and gave her a powder which made her vomit, and yielded her some relief. She fell on the floor; struggling dreadfully, violently; was placed on the bed; threw up a large quantity of blood, and nearly spoiled the bed. She was heard to exclaim, "Oh, what would I give to be saved!" In the coach she was very still and quiet, the violent struggles were over; as she was carried out of the coach she drew a deep sigh—her last. The verdict brought in was, "Poisoned herself in a state of temporary derangement."

Post mortem examination. (*From Mr. Taylor's Note-book.*)

The body fully developed, and exceedingly well-formed, covered with a thick layer of fat; pupils in the natural state; hair dark.

Head.—Dura mater presented, externally, several bloody points of considerable size; brain large; veins between the convolutions very much distended; a rather considerable effusion of blood within the cavity of the arachnoid, lying on the upper surface of the convolutions, especially in the right hemisphere. The congestion and effusion here were more marked than in more depending parts of the brain. Great congestion of the vessels of the pia mater; no liquid effusion under the arachnoid; the substance of the brain not so soft as might have been expected five days after death; cortical substance of a much deeper or browner gray than in health; white substance, on incision, exhibited numerous large bloody points of a darker colour than in health; a little serum near the lateral ventricle; choroid plexus congested; corpora striata of deep gray colour; cerebellum presented signs of congestion similar to those of the cerebrum, especially rather dark colour of the gray substance.

Chest.—Heart normal, containing little blood; calibre of the aorta small, embracing the point of the index finger soon after its exit from the heart; a little bloody serum in pericardium; lungs of a pretty uniform deep red colour, and tolerably filled with blood; a little bloody serum in left pleura; no sign of any disease in them.

Abdomen.—Lower half only of œsophagus examined. For two or three inches the mucous membrane considerably injected; then occurred an interval of paleness, after which it was red down to the termination. The stomach, of the usual size and form, contained a moderate quantity of fluid, in which, as well as adhering to its coats, was a considerable quantity of a darkish gray powder. The mucous membrane entire in its whole extent; not thickened; in its small curvature were lines of fine pink capilli-form injection; very considerable injection in the grand *cul de sac*, with many points of ecchymosis. The gray powder was adherent here in unusual quantity, as well as towards the pylorus, and which also presented similar morbid appearances.

Intestines, externally, of a red colour, apparently from imbibition; not further examined.

Spleen rather soft.

Liver and *gall-bladder.*—Nothing particular remarked.

Pancreas rather of a deep red colour.

Kidneys deep red, especially the tubular portion.

Bladder not examined; contains some urine.

Womb rather large; contained a good deal of gelati-form mucus. The mucous membrane, for half or three-quarters of an inch from fundus downwards, considerable congested. Left ovary converted into a serous cryst; none of the normal structure remaining; right ovary, one corpus luteum.

Chemical Examination of the Contents of the Stomach.

The quantity of the contents of the stomach, obtained for analysis, amounted to about a fluid ounce. It possessed the consistence of treacle, and exhibited the appearance of digested animal food or chyme. A similar mixture may be produced by digesting muscle, cut into small pieces, in some dilute acids, at a temperature equal to that of the human body. This is a point

of interest, because it did not appear from the evidence that any food had been taken during the whole of the day, up to four o'clock P.M. The nature of the contents of the stomach, however, demonstrate that animal food had been swallowed. The odour of the fluid mass was strongly acetous; litmus test-paper, when introduced into it, was immediately reddened. A similar effect was produced when a portion of the matter was brought in contact with a solution of litmus in distilled water.

About one-half of the matter was introduced into a flask by means of a small tube terminating in a capillary aperture. The fluids thus mixed were boiled over a spirit-lamp for twenty minutes, two ounces of distilled water, acidulated with sulphuric acid, being previously added. It exhaled a strong smell of nutmeg; the whole was then thrown upon a filter; the solid matter* remaining on the filter was well washed with boiling distilled water. The liquid which passed through the filter was evaporated on the sand-bath, and mixed with some finely-powdered marble; the whole was reduced to dryness. This was pulverised and introduced into a flask; successive portions of alcohol were then boiled with it, until the spirit ceased to be coloured, and to afford a residuum on evaporation. The alcoholic solution was then filtered, the residuum washed, and the solution evaporated to dryness. The residue occupied the bottom of the porcelain basin, in the form of a thin brown coating, possessing an intensely bitter taste, which deliquesced in the air; this matter was again dissolved in alcohol. When caustic ammonia was added to this solution brown flakes fell in abundance. With nitric acid a yellow characteristic solution was formed. When evaporated, the brown residue possessed a powerfully bitter taste. I then tried the effect of sulphocyanide of potassium, and obtained indistinct crystals, but not of such correct delineation as to warrant the praise which Artus has bestowed upon this test. The former characters, however, sufficiently demonstrate that the substance under examination was strychnin.

A solution of the strychnin in alcohol was introduced under the skin, on the back of a full-grown green linnet, and a small portion of the powder was placed in its mouth. The bird soon began to be spasmodically affected in the legs and wings, and after some time died with symptoms of convulsed legs and wings, and retraction of the head.

Remarks.—In reviewing the preceding case, there are some points which deserve notice in a medico-legal point of view.

1. *The verdict.*—Was it a logical deduction from the facts brought forward in evidence? We cannot decide that an individual is insane from one single *isolated* fact; for insanity is a series of facts or acts properly inferred from an imaginary origin. There does not appear to have been any thing analogous, as far as the evidence goes, in the instance under consideration, and no one could have been justified in even suspecting the unfortunate girl of insanity, from any act which she had committed previous to the last awful step of which she was guilty. When the poison began to act, she regretted her crime, which was certainly nor characteristic of insanity. The *rational* explanation appears to be, that she had formed an attachment which was only temporarily reciprocal. Having boasted to various individuals of her love, her vanity was galled by her inability to demonstrate to her friends any return of affection from her reputed lover; and having corresponded with him, and receiving no answer to her letters, she paid him a visit, which was not well received. This circumstance preyed upon her mind in her solitude, and she erroneously reasoned that it was preferable for her to commit suicide than to survive an unreturned love and the taunts of her acquaintances. The cause of her crime was, a *false morality*, not *insanity*.

2. The only treatment adopted was an emetic. In the absence of a stomach-pump, it was proper to have recourse to this palliative. But in every case where nux vomica

* The residuum on the filter was a coarse whitish brown powder; a portion was heated on charcoal before the blowpipe. Sulphuretted hydrogen was evolved, and metallic globules were speedily produced, which cut like lead, being quite soft. To prove the nature of the metal still more distinctly, a small portion was placed in a watch-glass, and covered with common aërated water. A white powder soon began to appear, which increased in quantity every day. It was soluble, with effervescence, in dilute nitric acid, showing that it was carbonate of lead. The powder, after digestion in water, was dried and exposed to the heat of a spirit-lamp; copious fumes of decomposed animal matter were evolved, and a gas was given out which caught fire and burned. A white powder remained, which, when treated by the process of reduction, was entirely converted into metallic lead. The various solutions and residue afforded no trace of the presence of alumina, showing that the alum, if any had been swallowed, had been carried away from the stomach, while the lead, which had been taken nine hours before death, still remained. A case is noticed in the German journals where lead was found in the stomach three days after it had been introduced into that viscus.

has been swallowed, the stomach should be emptied of its contents completely, and then carefully and frequently washed out with lukewarm water. This treatment is necessary, because the insoluble powder becomes mechanically adherent to the coats of the stomach, and requires repeated and somewhat forcible efforts to remove it from its place. It is impossible to impress too strongly upon medical men the absolute necessity of their having always at hand this important instrument, and great readiness in its application.

3. The lead, which had been swallowed nine hours before death, was detected in the stomach in considerable quantity, showing that when a salt of lead enters into that viscus, it combines with the animal matter, and no longer exists in its original state.

OBSERVATIONS ON SYRUPS.

BY M. GUIBOURT.

The first observations of M. Guibourt relate to the proportion of water and sugar which enter into the composition of syrups, and the relation of the areometrical degrees which they indicate at different temperatures. It is commonly admitted that syrup brought by boiling to 30°, should indicate 35° when cold. This has been disputed by M. Pector, a skilful experimentalist, who has pretended that the real degree was only 34°, and that the syrup reached 35° on account of the evaporation which took place during filtration and cooling.

M. Beral, in some experimental investigations concerning the syrup of sugar, found the following results:

Simple syrup.	boiling.	cold.
With 28 ounces of sugar .	30¼	34¼
,, 30 ,, ,, .	31	35
,, 32 ,, ,, .	31¾	35¾

Two inferences, says M. Guibourt, seem to flow from these results: first, that syrup brought by boiling to 30°, ought only to weigh when cold 34°, as Mr. Pector thought; next, that the syrup boiling at 30° contained less than 28 ounces of sugar, while it is generally admitted that it contains 32 ounces to 16 of water.

M. Guibourt wishing to resolve definitively these four questions so interesting to practical pharmacy, ascertained, by cooling syrup in a vessel accurately closed, that syrup brought to 30° by boiling, weighs exactly 35° when cold.

On the other hand, M. Guibourt dissolved in three different flasks, each of which had received 16 ounces of water 28, 30, and 32 ounces of well crystallized and perfectly dry sugar.

The specific gravity of the three syrups was determined at 17° centigrade, and was found:

	Density.	Areometric deg.
Syrup, with 28 ounces	1·311	34·20
,, ,, 30 ,,	1·320	35 weak
,, ,, 32 ,,	1·323	35·15

The syrup with 28 ounces appeared too fluid, and acquired in a few days, a disagreeable taste; the syrup with 32 ounces was too thick, the syrup with 30 ounces appeared to be the true normal syrup; this observation, contrary to received ideas, is very important to be remarked in the practice of laboratories.

ON THE GASEOUS CHALYBEATE WATER POWDER.

BY M. H. BRETON.

In a note which we published in the month of October of last year, upon the composition of the powders of M. Quesneville, one of our correspondents, M. Fage, (of Tulle,) laments that this M. Q. had not published his formula. Here is that given by the *Journal de Pharmacie*:—

Sugar	4 drachms.
Acid citrate of soda	1 —
Bicarbonate of soda	18 grains.
Double citrate of iron and soda	18 —

M. Breton, (of Grenoble,) wishing to make this mixture, and being unable to bring the citrate of iron and soda to such a state that he could mix it conveniently with the other substances, suspected some inaccuracy, and having analyzed some powder sent out from the shop of M. Quesneville, found, as M. Fage had already pointed out, that for the citrate of iron the sulphate of the same metal had been substituted. This is the result of his work. Sixteen grammes of the powder, which are the ordinary dose or a bottle, contain:—

Bicarbonate of soda	3·200
Tartaric acid	3·616
Sulphate of iron	0·152
Sugar	9·032

He observes, like M. Fage, that the tartaric acid and bicarbonate of soda are mixed in the state of coarse powder, in order that, being dry, reaction might not take place; the proportion of iron is here much weaker than in the first analysis published.

ON A NEW SPECIES OF QUINQUINA.

M. Guibourg made a very instructive report on a new species of quinquina, sent to the French Academy of Medicine by M. Lorenzana, minister of New Grenada at the court of Rome, and which was found to contain a great quantity of active alkaloid principles, which renders it very advantageous in therapeutics.

MARKET PRICE OF DRUGS.

	Duty	£	s.	d.
Acid, Oxalic		0	1	4
Benzoin		0	1	0
Citric		0	4	6
Sulphuric		0	0	1½
Muriatic		0	14	0
Tartaric		0	1	5
Ammon. Carb.		2	16	0
Mur.		2	12	0
Ærugo Cris. Exot.	6d.	0	1	10
Argent. Vivum	1d.	0	3	11
Antim. Crude		1	6	0
Aloes, Barb.	2s.	4s. 6d. a 6s. 6d.		
Socot.	,,	4l. a 12l.		
Hepatic	,,	4l. 10s. a 10l.		
Bals. Capivi	4s.	0	1	10
Canada	1d.	0	0	11
Tolu	2s.	0	2	6
Peru	1s.	0	5	0
Camphor		0	5	10
Cantharides	1s.	0	5	0
Coccus	1s.	0	5	0
Colocynth	2d.	0	2	2
Cort. Cinchon. pale	1d.	9d. a 2s. 6d.		
flav.	1d.	0	4	4
Cascarilla	1d.	2	10	0
Cream Tartar	2s.	3	8	0
Croci in fæno	1s.	0	19	0
Cubebs	6d.	5	0	0
Ess. Bergamot	1s. 4d.	0	11	6
Lemon	1s. 4d.	0	7	6
Fol. Senna Alex.	6d.	0	2	0
Tinny.	6d.	0	3	9
E. I.		0	0	9½
Galla Cærul.	2s.	4	2	0
Grains Parad.	2s.	13	0	0
Gum Ammon. gut.	6s.	0	2	6
Do. lump	6s.	0	1	0
Acacia, Turkey	,,	12	0	0
sorts	,,	6l. a 9l.		
Ind.	,,	3	0	0
Benzoin	,,	1s. a 4s. 6d.		
Fœtid.	,,	0	1	0
Guaiac.	,,	1s. a 2s. 6d.		
Mastic	,,	0	3	9
Myrrh, Turkey	,,	13	0	0
Scammony	2s. 6d.	0	16	0
Do. Virgin	,,	1	4	6
Tragacanth	6s.	9	0	0

	Duty.	£	s.	d.
Liq. Sassafras	2s.	1	2	0
Manna, Flaky	3d.	0	3	0
Magnes. Carbon.		3	15	0
Calcin.		0	1	8
Musk, finest	6d.	4	0	0
common		1	10	0
Ol. Amygdal.		0	1	0
Essent.		2	0	0
Anisi	1s. 4d.	0	7	4
Cajeput	,,	0	9	0
Cassia	,,	0	9	4
Cinnamon (oz.)	,,	0	9	0
Juniper	,,	0	3	2
Lavand.	4s.	0	9	0
Myrist. (oz.)	1s. 4d.	0	1	9
Origan.	,,	0	3	2
Rhodium (oz.)	,,	0	8	0
Ricini	1s. 3d.	3½d. to 8d.		
Rosimar.	1s. 4d.	0	3	0
Opium, Turkey	1s.	0	11	0
Otto Roses	1s. 4d.	0	13	0
Rad. Anchusæ	2s.	1	3	0
Caryoph.	4d.	0	1	4
Colombo	2s.	2	10	0
Curcumæ	2s. 4d.	1	8	0
Gentian	4d.	1	8	0
Helleb. alb.	1d.	2	5	0
Jalap	6d.	0	2	4
Ipecac.	1s.	0	1	6
Rhæi Ind.	1s.	5s. a 9s.		
,, Turkey	1s.	0	10	0
Sarsæ Hond.	6d.	0	2	2
,, Jam.	6d.	0	3	0
Serpent.	2s.	0	2	3
Sago, opt.	1s.	0	18	0
sec.	,,	0	12	0
Sal Acetos		0	1	8
Sang. Dracon.	4s.	2	16	0
Shellac, Liver	6s.	3	0	0
Orange	6s.	4	0	0
Sperm. Cæti		0	1	6
Soda Carb.		2	0	0
Tartar		3	15	0
Sulph. Quinine, F.		0	11	0
do. Ang.		0	10	0
Tamarinds	1d.	40s. a 85s.		
Vitriol Cærul.		1	17	0

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THE CHEMIST.

I. CHEMISTRY.

REVIEW OF THE TRANSACTIONS OF 1839.*

BY M. VEE.

The Chemical Sciences have not taken a higher flight in 1839 than in the year which preceded it, although a new metal, lantanium, has silently taken its place among the elements. These are become so numerous, that a new addition no longer causes sensation: it is a title whose lustre is dimmed, as every other, by multiplicity; and to which it is hoped some reformer will, sooner or later, do justice. Nothing, moreover, impedes such an event: the most eminent men, those who had given the most brilliant hopes, by studies stamped with a powerful spirit of generalisation, seem to be benumbed, when quite young in the enjoyment of academic chairs, or the honors of professorship; they seem more and more to resign themselves to the office of judges and analysts of the works of others, while they leave their laboratories to cool, and their pens to dry. Let us then welcome the new comers who have struggled in the lists which appear to be abandoned by the masters of the art. Pharmacy has furnished a principal part in recruiting the young chemists who are this year exhibited in the ranks. MM. Capitaine, Filhol and Hurant have taken the lead in serious works, which proclaim in them minds capable of rising to the highest deductions of science.

M. Robiquet cannot be classed among the academicians to whom a high position seems to suffice: we have had from him notices on the coloring matter of poligonum, on the milk of diseased cows, and a work relative to the action of heat on the citric and gallic acids, in which he has pursued complicated reactions in his usual clear and logical manner. M. Soubeiran, not contented with preparing a second edition of his excellent *Traité de Pharmacie*, has given useful practical instruction relative to the rectification of alcohol; he has continued to pursue the study he had commenced concerning the composition of soluble cream of tartar, and has arrived, in common with M. Capitaine, at some observations on tartaric acid, by which these chemists appear to have re-established in a most decided manner, a point of theory rather hazarded by the ingenious Liebig.

The decoloring compounds of chlorine, those Protei which seem to take a thousand different forms to escape examination, have again received from M. Millon a new and learned explanation. M. Bussy has discovered a curious chemical fact concerning the products of the combustion of coal pits. M. Payen has devoted himself to some remarkable works which have made known the nature of vegetable tissues insulated from all the products which they contain, or which are attached to them. M. Frémy has demonstrated some properties of organic membranes which are of a nature to throw great light upon the physiological act of digestion. M. Bouchardat has presented to the Academy the first results of experiments of high interest, to which he has again devoted himself, relative to the action of the simple bodies on the vegetable alkalies.

The study of the animal fluids has been pursued with ardour by MM. Lecanu, Denis and Chevalier, who have given an account of extensive experiments on milk, blood, and urine; in this order of investigations must also be included the interesting memoir of MM. Cap and Henry on the lactates and state of urea in the urine of man. Whatever may be the opinion which physicians adopt definitively concerning the alteration of the fluids, whether as the cause, or as the effect of a pathological state, this alteration is but too manifest; and if chemistry succeed in finding vigorous and easy means to be put in practice to prove the nature of it, it will be able to throw powerful light upon the diagnostic of dis-

* *Journal des Connaissances Médicales. No. 3.—Vol. I.—March.*

cases, and often to assure therapeutical applications.

This naturally leads us to speak of the investigations of M. Orfila, concerning the means of proving arsenic to be absorbed by the blood in cases of poisoning, of which the application of the ingenious process of Marsh has been the occasion. We have reported the first memoir of M. Orfila, and have stated how he arrived at finding in an entire subject some grains of arsenic. Since by an immense number of experiments, he has endeavoured to secure his process against all chance of error, and especially against those which might arise from arsenical matter proceeding accidentally from the vessels employed, or from the earth of the cemeteries, where he has shown that it has sometimes been found, in the bones of men which contain it naturally, in the soft parts and viscera, which also perhaps yield it. The learned toxicologist has shown the clues which may serve to lead us out of this labyrinth; but how circumspect should such discoveries render those charged with pronouncing upon cases where the life of men is concerned in the decision.

The most brilliant fact of the year 1839 is due to a man, who is neither a chemist nor a man of science, but an indefatigable investigator, endowed with that intelligent patience which has been said to be genius: it will be foreseen that we allude to M. Daguerre. His discovery, too much extolled before its publication, and certainly too much depreciated since, by some persons, is not less intrinsically a delightful result, which ought still to be elevated above all the labours to which it will serve as a starting point, and of which M. Daguerre will be considered as the father, notwithstanding all the endeavours which have been made to compare his process to the unformed attempts before him to sketch by means of light.

M. Daguerre, arriving without theory and as by a marvellous instinct at a process which he could not himself explain, and which at the moment made even men of science hesitate, evidently shows how, in the face of our chemical sciences, which sprung up but yesterday, our fathers who never knew them, and those illiterate people who in our days cannot yet comprehend them, have been able to bring to the most astonishing perfection, certain arts of industry, which seem to depend entirely upon these same sciences.

Pharmacy, properly so called, has given occasion also in the course of this year to some estimable works. The "Traité de Saccharolis Liquides" of M. Mouchon, the work of an enlightened and laborious practitioner, but conceived perhaps too much under the exclusive prejudice of the advantages which might be derived from new methods of lixiviation and displacing, has not the less served the progress of art, even by the discussions it has raised. We will say as much for the labors of M. Thierry on the clarification of mellites. A salt, known only to theoretical chemists, iodhydrargyrate of iodide of potassium, or double iodide of potassium and mercury, has been applied with advantage to medical use, by M. Puche, and its pharmaceutical forms pointed out by him. M. Bernard Derosne has published the use of a powerful astringent, derived from the vegetable kingdom, known at first by the name of monesia; the learned M. Guibourt has discovered its origin, and restored to it its Brazilian name of buranhem: the properties indicated by the books of the country have agreed, moreover, with those which had been recognized in it by the French physicians who have tried it.

It is also to M. Guibourt that we owe the best memoir on Medical Natural History which has appeared during the year; it is evident that we allude to his beautiful and fruitful investigations concerning turpentine, a medicament produced so near us in nature, and with regard to which, however, the grossest errors were accredited: we must not be astonished after having known such a fact, if we have still so many things to learn concerning the substances which come to us from another hemisphere.

If, leaving France, we cast our eyes upon what has been done in foreign countries, we shall see the German Chemical School, still laboriously occupied in the progress of science. We have not found, it is true, any trace of the recent works of the illustrious Berzelius, but the names of Liebig, Rose, Wöhler, Winkler, Hare, Marchand, Döbereiner, Duck, Viggers, Fehling and several others, have been exhibited in our columns, and have proved the zeal of the Germanic nations for the study of Chemistry, which makes it the more remarkable, that less has been produced elsewhere. Italy has, it is true, learned physicians, societies and journals, which keep pace with the progress of science, but which have noticed few facts produced in that country. We have nothing to expect from Spain, too much torn by civil wars to know aught of studious leisure: but we are astonished at the silence of England, that classic land of intelligence and activity: the country of Priestley and of Davy, seems to slumber; and we have not seen, this year, in the numerous repertories we have looked over, any remarkable observation, to distinguish the labours of her sons.

In investigating the causes which have induced this penury, we find in the first rank the condition of Pharmacy in that country, where works of practical chemistry

are perhaps followed with more ardour than any where else, but by manufacturers, who do not appear desirous of publishing the entire processes by which they operate. As for Pharmacy, such as is understood in France, and especially in Germany, we do not see a trace of it in England; which has its surgeon apothecaries, who aspire to the rank of medical doctors, and often attain it, and apothecary druggists who think more of the profitable concerns of a rich trade, than of barren theoretical speculations. We have hitherto vainly sought in London, a society or a journal especially consecrated to theoretical Pharmacy. We must not then be astonished if in the long list of men and labours which for the most part have issued from our profession and done honour to France and Germany, we have had the regret of being unable to quote this year any English name. Is not this fact a hint to our legislators concerning the directions to be given, in France, to the Pharmaceutical art?

PHENOMENA OF DIATHERMANCY.*

BY PROFESSOR FORBES.

Professor Forbes writes from Edinburgh on the 20th of December, to remark that he had published, prior to M. Melloni, a fact analogous to the discovery which the latter had communicated to the Academy in the sitting of the 7th of September last. This regards the discovery of a medium which transmits in greater abundance heat derived from a source at a lower temperature than that which arises, for example, from the flame of a lamp.

M. Melloni, says he, has an idea of blackening by smoke a plate of rock-salt, which is then found to be endowed with this property, which he rightly compares to the character of red glasses for light. But I have proved in a memoir published in May 1838, that mica, reduced to excessively thin plates by the action of fire, possesses the faculty of transmitting in the smallest quantity the calorific rays transmitted by glass as the direct rays of the lamp. Consequently mica, thus modified, enjoys a property contrary to that of glass and of most known substances, even mica which has not been subjected to the action of fire. Since that time, I have tried other pieces which transmit twice as many rays from a source at a low temperature, absolutely deprived of light, as those of the lamp transmitted by ordinary glass. I have repeated the experiment of M. Melloni with success, and I find that these two substances, smoked rock-salt and exfoliated mica, have, in this respect, a complete analogy.

Wishing to investigate, continues Professor Forbes, what was, in the experiment of M. Melloni, the influence of the surface, I took a plate of rock-salt, I removed the polish by making rectangular striæ with fine sand, and I found that this plate, instead of transmitting 92 per cent. of any incident rays whatever, let pass 45 per cent. of rays of low temperature, and only 17 per cent. of luminous rays emerging from a plate of glass. A sheet of ordinary mica, which transmits a much greater proportion of luminous than of dark heat, being deprived of polish in the same manner, transmitted a much greater relative proportion of the second kind of heat.

This influence of the mechanical state of the surface of bodies cannot be attributed to the inequality of the reflexion of these different kinds of heat; for, 1st, I have proved that heat arising from any source whatever is reflected on polished surfaces with an intensity entirely or very nearly equal; 2d, these differences much surpass the quantity of heat reflected at perpendicular incidences; 3d, I have proved that striped surfaces reflect (at least for considerable incidences) a greater proportion of dark heat. It is consequently a stifling (*étouffante*) action of striped surfaces on incident heat (like the mutual destruction by the interference of luminous rays) which acts unequally on calorific fluxes of different origins. I have proved by direct experiments that heat receives a real modification during its transmission by unpolished rock-salt and exfoliated mica as well as by smoked salt. I find that the transmission of heat through one of these substances renders it more capable of traversing the others, or a second plate similar to the first.

In order to appreciate the effect of stripes on the diathermancy of rock-salt, the author striped a surface with the point of a diamond, in different manners. In all these cases the faculty of giving passage to the dark rays in preference to the luminous rays was so much the more marked as the surface was more striped. The powder of an athermanous substance was introduced between two polished plates of rock-salt; dark heat was spread more easily than the other through this system. The tarnished surfaces of plates of rock-salt exposed for a long time to the action of air and humidity presented the same phenomena.

All these facts, resumes Professor Forbes, are sufficient proofs of the unequal influence of the mechanical condition of surfaces on the immediate transmission of the heat arising from different sources. The analogy which they present with some cases of interference in the theory of light is, he thinks, sufficiently striking eagerly to excite curiosity to ulterior investigations.

* From *L'Institut*, No. 315, Jan. 9, 1840.

PROPERTIES OF HEAT.*

BY M. MELLONI.

M. Melloni transmitted from Naples, on the 9th of December, the results of a long series of observations which he has made on solar heat. In repeating the analysis of these rays by means of a prism of rock salt, he has proved that the maximum of temperature is not always at the same place in the dark space beyond the red limit of the spectrum, but sometimes nearer, sometimes further from the colours, and *that* in perfectly similar circumstances as to the force of the radiation, to the serenity of the sky and transparency of the air.

M. Melloni concludes from this, that the calorific rays deprived of light come to us in greater or less quantity according to the state of certain atmospheric constitutions which do not exercise any influence on the transmission of luminous rays. Now, it seems to me, he remarks, that there is a great analogy between this phenomenon and that observed by M. Daguerre relative to the diverse action of chemical radiations corresponding to equal heights of the sun above the horizon. In this latter case, it would be the dark part of this radiation situated beyond the violet limit which would undergo on its path a greater or less absorption, in virtue of a certain modification which would not alter the transparency of the atmosphere. It is true that, in this hypothesis, it must be admitted that the permeability of the air, for dark chemical rays, may differ, in certain cases, from its permeability for luminous rays. But have we not now a very great number of facts which prove that it is really thus with respect to optical, calorific, phosphogenic, and chemical effects produced by the same radiation?

DISENGAGEMENT OF CALORIC IN MULTIPLE PROPORTIONS.†

BY M. HESS.

Under this title, M. Hess read, on the 1st of March, a note in which he made known some experiments which took place under the observation of MM. Fuss and Jacobi, whose evidence is another guarantee of the accuracy of the facts declared. M. Hess took sulphuric acid at different degrees of hydratation containing from 1 to 6 atoms of water for 1 atom of sulphuric acid, and observed the elevation of temperature arising from the mixture of this acid with an excess of water. In relating the quantities of heat disengaged by the same quantity of anhydrous acid, he found that the cyphers which expressed the relative quantities of disengaged heat were multiples or nearly so. For example:

For 1 of anhydrous acid	found	calculated	multiples	differ.
$\dot{H}^6\dddot{S}$ disen. for	43·8	43·8	2	1
$\dot{H}^4\dddot{S}$	67·2	65·7	3	1
$\dot{H}^3\dddot{S}$	93·5	87·6	4	
$\dot{H}^2\dddot{S}$	132·6	131·4	6	2
$\dot{H}\dddot{S}$	222·5	217·8	10	4

We shall soon be convinced, says M. Hess, that these multiple proportions present a great analogy with the multiple proportions known for ponderable substances. In all cases, the quantities of heat disengaged prove to us that there exist more than three definite combinations between water and sulphuric acid. We know, on the one hand, that the first atom of water is found to be retained with more force than the second, the second with more force than all those which follow, and the cyphers which I have just presented prove to us that the more intimate the combination which is formed, the greater is the quantity of heat. That permits us to hope that the exact measure of the quantities of heat will give us the relative measure of affinity, and will lead us to the discovery of its laws. It is true that the case which I present is as yet the only one proved with sufficient accuracy; but I have already found several which approximate to it. I am employed in extending these experiments to several substances, and in investigating whether or not there exists a caloric equivalent which is met with in all combinations of analogous constitution.

CONGELATION.*

BY M. CAGNIARD-LATOUR.

M. Cagniard-Latour communicated the result of an experiment on congelation which he had just made on a marteau of water, of small dimensions, namely, whose tube is only about 25 centimetres in length, and 8 millimetres in interior diameter, which had been exhausted of air with all possible accuracy. The principal object of this experiment was to know whether the water of the marteau, being solidified by cooling, would contain cavities, or gaseous bubbles, as is seen in ordinary ice. After the marteau of water had been prepared, care was taken, a moment before commencing the experiment of congelation, to keep it plunged by its inferior part in a water

* *L'Institut*, No. 315, Jan. 9, 1840.

† *L'Institut*, No. 318, Jan. 30, 1840.

* *L'Institut*, No. 318, Jan. 30, 1840.

bath until the ebullition of which the liquid column of the marteau had first become the seat had ceased to manifest itself, even while the top of the tube was kept wetted with cold water. This experiment of congelation has been repeated several times, and has always presented the same result, namely, that water of a like marteau always allows cavities or gaseous bubbles to be perceived when it is congealed. The author has seen, as he had expected, according to the observations of M. Despretz, that the water of his marteau, although it was at 10° per cent. below zero, remained liquid, but he recognized that its passage to the solid state could be very easily determined, and that it suffices for this effect, to strike with sufficient force the lower part of the tube upon a hard body, as, for instance, a marble table.

ON THE LAW OF SUBSTITUTIONS AND THE THEORY OF TYPES.*

BY M. DUMAS.

This memoir is a reply to the criticisms which have been made, especially by M. Berzelius, on the theory of substitutions and other theoretical views set forth by M. Dumas. Having given in our columns the text of a memoir of M. Berzelius, the publication of which has perhaps contributed to hasten the publication of this memoir by M. Dumas, we for the present content ourselves with enumerating the series of questions which M. Dumas treats in it. These questions are the following. To express them, we make use of the very words of the author.

1st. In every combination, may elements be replaced, equivalent for equivalent, by simple bodies or by bodies which act as such?

2nd. Are not these substitutions often effected without the general nature of the compound being altered? bodies thus produced belong then to the same chemical type as those from which they are derived.

3rd. In other cases, may these substitutions furnish products entirely distinct, by their reactions, from those which have given rise to them, and is it, nevertheless, expedient to consider them as belonging to the same molecular type?

4th. May not the nomenclature of organic substances, from this time forward, be perfected in such a way that the name of each body may express the chemical or even the molecular type to which it belongs?

5th. Do the phenomena of substitution oblige us to modify profoundly the value attached, until latterly, to organic radicals?

6th. Is not the electrical action attributed to the elements of compounds by the electro-chemical theory a complete contradiction of the phenomena of substitutions?

* *L'Institut*, No. 319, Feb. 6, 1840.

PREPARATION OF OXY-HYDROGEN GAS.†

BY MM. HESS AND JACOBI.

MM. Hess and Jacobi occupied the Academy, in the sitting of the 22nd February, with experiments which they had made with the view of facilitating the preparation and employment of oxy-hydrogen gas. The employment of expensive gasometers, the danger more or less great which is the consequence of it, the difficulty of preparing a considerable quantity of oxygen, have hitherto prevented the use which might have been made, whether for lighting, or for the fusion of very refractory substances, of the mixture of the two gases oxygen and hydrogen. MM. Hess and Jacobi have found that the use of voltaic apparatus might much diminish these difficulties. The experiments which they have made have shown them that a voltaic battery of 10 square feet of zinc is sufficient to produce, by the decomposition of the water, 1 cubic foot of the detonating mixture per hour. Now, a Drummond lamp, such as has been tried for light-houses, and possessing an illuminating power of 123 wax lights of 1¼ inches in diameter, consumes 6 cubic feet of gas per hour. To produce this effect then during a given time, such a battery of 60 square feet of zinc would be sufficient, as by superposing the apparatus, might be contained in a space of 4¼ feet square by 4 feet in height. For ordinary lamps, which are far from requiring so great an intensity of light, such an apparatus would find without difficulty the necessary room. The advantage of these apparatus is considerable. Thus, one person is sufficient to ascend and charge them in the space of three quarters of an hour; they do not require any preparation, and render the provisions of gas useless, inasmuch as it is consumed as it is produced; the disengagement of the gas is perfectly uniform, as MM. Hess and Jacobi have ascertained. MM. Hess and Jacobi propose to give this gas the name of *electrolytic gas*, on account of the source from which it is obtained.

† *L'Institut*, No. 318, Jan. 30, 1840.

ACTION OF ALCOHOL ON THE ALKALIES.*

BY MM. DUMAS AND STASS.

M. Dumas read, in his name and that of M. Stass, the following note relative to the action of the alcohols on the alkalies.

We have observed, he said, by precise experiments, the following results:—1st, Pure alcohol, $C^8\ H^{12}\ O^2$, is converted, under the influence of hydrate of potassa and heat, into pure hydrogen, and equally pure acetic acid, $C^8\ H^8\ O^4$; 2nd, Pyroligneous acid, $C^4\ H^6\ O^2$, under the same circumstances, furnishes formic acid $C^4\ H^4\ O^4$, and pure hydrogen; 3rd, Ethal $C^{64}\ H^{68}\ O^2$, by the same reaction, is converted into a new acid, ethalic acid, $C^{64}\ H^{64}\ O^4$, and disengages pure hydrogen like the two preceding bodies; 4th, Potato oil, $C^{20}\ H^{24}\ O^2$, treated in the same manner, furnishes hydrogen, giving rise to a volatile liquid and oleaginous acid $C^{20}\ H^{20}\ O^4$. Theory indicated that this acid would have the same composition as the acid which is furnished by valerian, and which is called valerianic. Experiment has given us an acid which affords exactly its composition $C^{20}\ H^{20}\ O^4$, which presents all its properties and even its smell, and which makes, like it, salts with a sweet taste. It appears to us almost certain that by means of this action of hydrate of potassa, we are able to transform potato oil into an acid which seemed very dissimilar to it, the valerianic.

What clearly results from the four preceding experiments, is, that every alcohol is converted, under the influence of the hydrated alkalies, into an acid which corresponds with it, and that it is done always by losing four volumes of hydrogen and gaining two volumes of oxygen, conformably to the theory of types and the law of substitutions.

Glycerine has also furnished us pure hydrogen by the action of potassa, but we have not yet been able to separate the acid which resulted from the reaction, and which appears capable of furnishing secondary products with the greatest facility.

We have found in the preceding results the means of explaining the action of alcohol upon anhydrous baryta, an action of which we have ascertained the results by certain experiments which constitute in some sort a method of qualitative analysis applicable to mixtures of carburetted gases.

When a current of pure alcohol was directed on anhydrous and heated baryta, there was developed in our experiments three gases at least, and perhaps four. The first consisted of olefiant gas, which Nordhausen sulphuric acid absorbs, and which chlorine changes into Dutch liquor. We are convinced of this by analysis of the latter. The second consists in gas of marshes which remains after the olefiant gas has disappeared, and which may be converted by means of chlorine into chloride of carbon $C^4\ C^{l8}$, which corresponds to it. We have performed the analysis of this chloride of carbon. The third is hydrogen, which was indicated by eudiometrical analysis. The fourth would be oxide of carbon.

The first three gases, whose existence is incontestible in the mixture which we obtained, seemed to be derived from the following actions:—

1st, Anhydrous baryta in acting on alcohol would give hydrate of baryta and olefiant gas; 2nd, The hydrate of baryta thus formed would produce, with a new portion of alcohol, hydrogen and acetate of baryta; 3rd, The acetate of baryta in presence of an excess of base would furnish gas of marshes and carbonate of baryta.

Thus the action of anhydrous baryta on pure alcohol yielded us three distinct gases, resulting from three reactions probably distinct also. We have not been able to seize in any manner the conditions in which MM. Pelouze and Millon are placed, who have declared, as is known, that anhydrous alcohol and baryta furnish: 1st, Carbonate of baryta; 2nd, A gas furnishing its volume of carbonic acid, absorbing twice its volume of oxygen, in a word, endowed with the same composition as the gas of marshes.

It is known that MM. Pelouze and Millon have announced moreover that this gas is isomeric with the gas of marshes, that is to say, that it has its composition without its properties, and that its production as well as its conversion by bromine into hydrocarburet of bromine, are so many facts incompatible with the theory of types. Without pretending in any way to invalidate the experiments of MM. Pelouze and Millon, concerning which we expect the details which will permit them to be repeated with success, we can then declare here that according to our own investigations: 1st, The action of alcohols on the hydrated alkalies is shown to be very simple, and perfectly conformable with this theory, for every alcohol loses by substitution 4 vol. of hydrogen, gains 2 vol. of oxygen, and produces an acid which corresponds to it, an acid of the same type; 2nd, The action of alcohol on anhydrous baryta is, on the contrary, a very complex action which gives rise to mixtures of carbonate and hydrate of baryta in the residue, to a mixture of olefiant gas, gas of marshes, hydrogen, and probably oxide of carbon in the gaseous products. According to MM. Pelouze and Millon, there would be made in this last case pure carbonate of baryta, and a homogeneous gas endowed with extraordinary properties. We

* *Comptes Rendus*, No. 7, Feb. 1840.

have not been able to place ourselves in favourable conditions to find the results they have announced.

After this lecture M. Pelouze replied, and maintained the accuracy of his experiments, which he has repeated quite recently. If M. Dumas has not obtained the same results, it is doubtless because he is placed in circumstances of temperature and others, different from those in which M. Millon and himself had operated.

ACTION OF CHLORINE ON THE CABURETTED HYDROGEN OF THE ACETATES.*

BY M. DUMAS.

A note by M. Dumas was communicated, under this title, of which we now give the greater part.

Acetic acid treated by chlorine gives rise to chloracetic acid: the latter, under the influence of the alkalies, is converted into carbonic acid and chloroform. If there exists an anology of type, as I have announced, between acetic and chloracetic acid, the first should give, with alkalies, a carburetted hydrogen $C^4 H^3$, corresponding to chloroform $C^4 H^3 Ch^6$. The production of this carburet, under the influence of the alkalies, is not proved; but if the carburet $C^4 H^3$, produced by acetates corresponds to chloroform $C^4 H^3 Ch^6$, it should give rise, by means of chlorine, to the following series:

$C^4 H^6 Ch^2$ hydrochlorate of methylene.
$C^4 H^4 Ch^4$ id. chlorated.
$C^4 H^3 Ch^6$ chloroform.
C^1 Ch^6 chloride of carbon.

I have made many experiments to put in evidence the production of these different bodies. Here follow the details of the experiments, from which M. Dumas draws the conclusion, that the gas of the acetates acts under the influence of chlorine as the law of substitutions and the theory of types, indicated beforehand, since the body $C^4 H^6$ is changed into $C^4 Ch^6$. To be sure, adds he, this conclusion concerns only the gas of the acetates; for I have not made any experiment upon the gas of marshes, properly so called, and I have not occupied myself much with the gas of alcohol, which might be but a simple mixture. I maintain, then, purely and simply my preceding conclusions. Acetic acid and chloracetic acid belong to the same type; it is the same with chloroform and the carburetted hydrogen gas of the acetates; for acetic acid produces the carburetted gas under the same circumstances as those in which chloracetic acid yields chloroform; and chloroform, as well as the carburetted gas of the acetates, are both transformed by the action of chlorine into a chloride of carbon $C^4 Ch^6$ which belongs to the same type as them.

At the conclusion of the communication of the note of M. Dumas, M. Pelouze said that in submitting to the action of bromine, the proto-carburetted hydrogen gas arising from the decomposition of alcohol by baryta, he had obtained, in concert with M. Millon, hydro-carburet of bromine corresponding to the liquor of the Dutch; that this combination, perfectly identical with that which is obtained with olefiant gas, appeared to him impossible to be explained according to the law of substitutions of M. Dumas. He adds that he thinks that this law, when it is shown, is only a peculiar case of chemical equivalents; and that he has undertaken, with M. Millon, experiments with the view of confirming his opinion in this respect.

* *L'Institut*, No. 318, Jan. 30, 1840.

CONTRIBUTIONS TO THE HISTORY OF TARTARIC ACID.†

BY MM. SOUBEIRAN AND CAPITAINE.

MM. Dumas and Liebig have observed that tartar emetic loses, by heat, two equivalents of water more than other tartrates. This observation having conducted them to particular considerations concerning the composition of tartaric acid, it became interesting to enquire whether the tartrates which have an elementary composition analogous to that of emetic did not possess the same property, which is what we propose to do in this memoir.

The ferro-tartrate of potassa which was first examined with this view, did not yield to experiment; heated to a temperature which did not exceed 130°, it allowed water and carbonic acid to be disengaged at the same time, and the oxide of iron was partly reduced.

This easy reduction of ferro-tartrate of potassa explains why, in drying it, a mass almost insoluble in water is often alone obtained: it explains, also, why a chemist, Phillips, has found but half an atom of iron in this salt; it is because it is decomposed even at the temperature of boiling water. MM. Soubeiran and Capitaine recommend it to be prepared by digesting cream of tartar and hydrated peroxide of iron in water at a temperature not exceeding 60°; thus is obtained a perfectly saturated solution, which is evaporated in plates upon a stove; the salt is then presented under the form of transparent scales of a reddish brown; it contains one equivalent of iron.

The boraxated tartrate of potassa (soluble cream of tartar) should yield to experiment

† *Journal des Connaissances Médicales*, January, 1840.

better by reason of the difficult reduction of the borax; the serious difficulty which is here presented in obtaining this salt which is uncrystallizable, in the state of perfectly definite proportions. M. Soubeiran procured from it, by precipitating with alcohol, a concentrated solution of soluble cream of tartar; he heated the molasseous matter which was precipitated from it, and submitted it two or three times to the same operation.

Soluble cream of tartar perfectly dried at a temperature of 100° can afterwards sustain a heat of 285° centigrade without changing character; but it has constantly lost a proportion of water equivalent to two atoms, which perfectly assimilates it to emetic.

This loss of water could not be reconciled with the admitted elementary composition of tartaric acid, which is $C^8\ H^8\ O^{10}$.

M. Liebig thinks that part of the base of the salt is reduced, and that its oxygen is united to the hydrogen taken from the acid to form the two atoms of water; thus, he regards as experimentally proved, what had sometimes been admitted by a simple hypothesis, the presence of unoxidized metallic bases in salts.

MM. Soubeiran and Capitaine do not partake this opinion; they remark that if, on one hand, by heating emetic to the point at which the acid is destroyed, part of the antimony is found in the metallic state; on the other, by heating in the same manner soluble cream of tartar, the borax is not found to be in the least reduced. MM. Soubeiran and Capitaine prefer to admit that the two atoms of water were quite formed and united, in the state of base, to the tartaric acid, whose true formula would then be $C^8\ H^4\ O^8$. This acid would always be united to at least four equivalents of base, whether water or oxide; but in salts with excess of base, the two atoms of water might be driven away without the properties of the salt being destroyed, because the excess of base would just complete the four equivalents indispensable to its constitution; as it is only with these salts that the above-mentioned experiment can succeed.

ON SEVERAL NITRITES AND CHLORIDES OF ANTHRACENE.*

BY M. LAURENT.

By boiling anthracene with nitric acid, four different compounds are obtained which have much analogy between themselves and with different compounds which I have already made known under the names of nitrites of naphthalase, naphthalese, chrysenase, pyrenase, &c.

These four compounds are more or less soluble in ether: it is with the assistance of this solvent that they may be separated from one another. They are crystallizable; their most prominent character consists in the property which they possess of entering into ignition when they are heated in a close vessel.

When they are slowly heated, they allow a crystalline matter to sublime which I made known some years ago under the name of paranaphthaline.

Chlorine and naphthaline give a compound in which two equivalents of hydrogen are replaced by two equivalents of chlorine.

The following is a table of the composition of these bodies; the second term is not known.

	Anthracene .	$C^{60}\ H^{24}$.
Products of the action of nitric acid.	Nitrite of anthracenase .	$C^{60}\ H^{22}\ O + A^2\ O^3$.
	Binitrite of anthracenese .	$C^{60}\ H^{20}\ O^3 + 2\ Az^2\ O^3$.
	Trinitrite of anthracenese .	$C^{60}\ H^{18}\ O^3 + 3\ Az^2\ O^3 + 3\ H^2\ O$.
	Nitrite of anthracenise .	$C^{60}\ H^{16}\ O^3 + A^2\ O^3$.
	Nitrite of anthracenose .	$C^{60}\ H^{16}\ O^4 + A^2\ O^3 + H^2\ O$.
Product of the decomposition of the preceding.	Anthracenuse .	$C^{60}\ H^{14}\ O^5$.
	Chloranthracenise .	$C^{60}\ H^{20}\ C^4$.

* *Comptes Rendus*, No. 4, Jan. 27, 1840.

SEA SALT CONTAINING IODIDE OF POTASSIUM.†

BY M. A. BOUCHARDAT.

Several political journals have called public attention to a fact which is more important than they have announced.

Some years since, the saltpetre makers employed in the manufacture of the sodas of Wareck, and obtained as a secondary product, sea salt, which they sell in commerce without paying the duty; the trea-

† *Journal des Connaissances Médicales*, January, 1840.

sary and municipal customs found themselves thus defrauded of considerable sums. It is an evil, without doubt, but society would experience a much greater injury, which is that the salt sold in commerce contains a very considerable proportion of iodide of sodium and that public health may suffer thereby; this fact has been proved to the central pharmacy, and since that time, the administration of hospitals has ordered the salt to be analysed which is received into its establishments. Several provisions have already been refused. To prove the presence of the iodide, it is sufficient to put 10 grammes of the suspected salt into a flask of the capacity of 200 grammes, to pour into it an excess of sulphuric acid, placing in its neck a piece of paper steeped in the jelly of starch, it immediately turns blue if the salt contain a notable quantity of iodine.

NEW PHOTOGENIC PAPER, INTO THE COMPOSITION OF WHICH THERE ENTERS NO SALT OF SILVER.*

BY M. MUNGO PONTON.

The paper which M. Ponton proposes has the same inconveniences as that which attaches to the process of Mr. Talbot, namely, of giving shade to the light parts, and *vice versâ*; but it has an advantage over the latter of being more economical and more easily employed. We shall continue to notice all the modifications which may be made in photogenic processes, however slight they may be, in the idea that the knowledge of the different circumstances in which light may act upon bodies is of a nature to furnish natural philosophers and chemists with results of chemical and optical interest. The following are some details concerning the process of M. Ponton.

M. Ponton tried to prepare photogenic paper with chromate of silver; and with this view he first employed neutral chromate of potassa, afterwards the bichromate of the same base, and he perceived that when paper was steeped in a solution of bichromate of potassa alone, it experienced a rapid and energetic influence from the action of the solar rays. In consequence, he had an idea of making use of this paper to obtain drawings, without knowing in what manner he should preserve them upon it. The event exceeded his expectation. In exposing an engraving, for example, in the ordinary manner upon this paper, the part exposed to the light rapidly becomes of a fawn colour, passing more or less to a bright orange, according to the strength of the solution and the intensity of the light. The black portion retains the original colour of a bright yellow, so that the object is thus represented in yellow upon an orange ground, with gradations of tints or shades according to the greater or less degree of clearness of the details. In this state the drawing, although very fine, cannot be kept a day. To fix it, all that is to be done is to plunge it carefully into water, and it is found that the portions of the salt which have not been exposed to the action of light are dissolved with facility, while those which have experienced it remain fixed and unalterable upon the paper. We have then a white drawing upon an orange ground, and that completely stable. Exposed for several hours to the sun, the colour of the ground loses its tint, but not more than most colouring matters.

The action of light on bichromate of potassa differs from that which it exercises on the salts of silver. Such of the latter as are not blackened by the solar rays, are by themselves insoluble in water, so that it is difficult to impregnate the paper with it in a very equal manner. The black colouring seems the result of the formation of oxide of silver. With bichromate of potassa, a very soluble salt, nothing is so easy as to saturate the paper completely with its solution. The action of light changes the colour of the salt, and takes from it at the same time its solubility in water. This effect appears to the author to be owing to the liberation of the chromic acid, which is of a deep red colour, and which seems to combine with the paper. This explanation is rendered very probable by the fact, that the neutral chromate does not present, under the same circumstances, any apparent alteration. It is especially in the violet rays of the spectrum that in this case chemical action resides, as it is, moreover, with salts of silver. To demonstrate it, the author filled three flattened flasks, one with an ammoniacal solution of copper transmitting violet rays, another with a solution of bichromate of potassa allowing yellow rays to pass, and the last with a tincture of iodine giving red rays. The paper was rapidly coloured by the rays transmitted by the first, but not at all by the two others, although the intensity of the light which traversed the solution of bichromate of potassa was much more considerable than that which the ammoniacal copper allowed to pass.

The best method of preparing this photogenic paper consists in employing a saturated solution of bichromate of potassa, and in well impregnating the paper and drying it rapidly before a good fire, carefully excluding daylight. Paper, thus prepared, acquires in the sun a very bright orange tint. If the solution is weaker, or even the desiccation less rapid, the colour will be less

* *L'Institut*, No. 316, Jan. 16, 1840.

deep. A different and agreeable tint may be obtained by mixing sulphate of indigo with the bichromate of potassa; the colour of the object and that of the paper are in this case of different shades of green. The object is, then, of a deeper tint than the ground. Paper, impregnated with bichromate of potassa, is as sensible as most papers prepared by the salts of silver, although it is inferior to some of them. It is not sensible for the figures of the camera obscura, but it is excellent for copying dried plants, engravings, &c. Its great superiority is in its cheapness, and the facility of its preparation. A pound of bichromate of potassa costs only three francs—the price of half an ounce of nitrate of silver. The preparation of salts of silver requires nice and delicate precautions, while the preservation of the paper of bichromate of potassa, and the fixation of the images, are so simple, that it cannot be doubted that they may usefully be turned to profit by lithography itself.

ON THE DECOMPOSITION OF ORGANIC SUBSTANCES BY BARYTA.*

BY MM. PELOUZE AND MILLON.

In treating acetic acid by chlorine, M. Dumas has made the discovery of a new acid which he has named chloracetic; he has observed that this acid, under the influence of alkaline bases, is transformed into carbonic acid and chloroform, and he has thought to be able to assimilate immediately this latter transformation with that which, in the same circumstances, acetic acid undergoes. Thus acetic acid, $C^4 H^6 O^3$, $H^2 O$, and chloracetic acid $C^4 CL^6 O^3$, $H^2 O$ giving with the alkalies, the first, gas of marshes $C^2 H^6$, the second, chloroform, $C^2 CL^6 H^2$, the gas of marshes and the chloroform belonged to the same organic type, and would be as near to one another as the acids from which they are derived.

The production of the gas of marshes takes place under many circumstances; but in none has it been shown in so clear and curious a manner, as in the experiment of M. Dumas. However, the same experiment, the same results were noticed by M. Persoz, in a work entitled: *Introduction à l'étude de la Chimie moléculaire.* This chemist expressly says that in decomposing the acetic acid in acetate of potassa, by 1 equivalent of hydrate of potassa, 2 equivalents of carbonate of potassa are obtained and 4 volumes of the gas of marshes, $C^2 H^6$ which he names, on account of its composition, tetrahydroguret of carbon. M. Persoz, although actuated by theoretical ideas which differ from those of M. Dumas, equally sees the preservation of type.

It seems to us that the production of the gas of marshes did not offer any connection with the constitution of acetic acid: that there was there a phenomenon of the same order as those which were remarked by one of us, some years ago, in the decomposition of formic acid by potassa, of the same order as the phenomena observed by M. Mitscherlich, by M. Peligot in the decomposing action of lime upon benzoic acid, and by M. Bussy, when noticing margarone and paraffine.

In a word, we have found a true decomposition, a destruction of the substance, and it is in this point of view that we have devoted ourselves to some investigations.

Absolute alcohol has such a composition that it may be transformed into carbonic acid and gas of marshes, $C^4 H^{12} O^2 = CO^2 + C^2 H^{12}$; we have made it pass over anhydrous baryta, at a temperature approaching a dull red, and we have completely transformed it into carbonic acid, which remains upon the baryta, and into gas of marshes which is disengaged in abundance.

There is, then, a new source of gas of marshes in alcohol, and surely, no one will be able to see even a distant relation between these bodies. Is there a greater relation between acetic acid and gas of marshes?

Formic acid $C^2 H^2 O^3$, $H^2 O$, may be represented by $C^2 O^4$, H^4, that is to say, by carbonic acid and pure hydrogen: when heated with an oxide, it is indeed decomposed into carbonic acid which remains upon the oxide, and into pure hydrogen†. In this circumstance, half of the hydrogen comes from the water, which has been decomposed by the carbon of the formic acid, under the influence of potassa. This mode of decomposition, already more advanced than that by anhydrous baryta, has caused us to expect an analogous destruction for alcohol, by employing hydrate of baryta. We then made the gas of marshes proceeding from the decomposition of the alcohol pass over hydrate of baryta, and obtained hydrogen in great quantity.

Naphthaline is burnt in the same manner, giving rise to a disengagement of hydrogen.

The anhydrous oxalates heated with baryta give, as we know, oxide of carbon: by substituting hydrate of baryta, we obtained hydrogen.

We were thus led to decompose oxide of carbon itself by hydrate of baryta: it yielded us pure hydrogen.

Lastly, carbon heated with an excess of hydrate of baryta, passed to the state of carbonic acid which combined with the base, while hydrogen was again disengaged.

In setting out upon the preceding ex-

* *Comptes Rendus*, No. 2, January, 1840.

† *Ann. de Ch. et de Phys.*, 1831, vol. xlviii. p. 398.

periments, we expected to be able to draw the following very simple conclusion: anhydrous baryta removes from organic substances all the carbonic acid which their elementary composition permits them to furnish; hydrate of baryta pushes the destruction farther, and tends to consume all the carbon, while the hydrogen which arises from the substance is combined with that which proceeds from the decomposition of the water and is in a state of freedom. It is understood that by virtue of this rule those isomeric substances which differ in their intimate composition, should all arrive at the same final destruction.

In the products which result from this violent reaction, there is not, according to us, any other relation with the primitive substance than that which is immediately derived from the same composition as the latter. Its molecular *arrangement* and its type are annihilated. We cannot better compare this action of baryta than with that of copper on organic substances. With the oxide of copper, the carbonic acid which is produced at the expence of the organic matter is disengaged and the copper remains; with baryta, the carbonic acid remains combined. The only difference arises from this, that the oxide of copper is of easy reduction, and consumes hydrogen as well as carbon, while baryta is not reduced in any case; let us add that it is the water alone of the baryta which furnishes its oxygen to combustion, and that hence hydrogen should be disengaged in a free state.

Remarks of M. Dumas on the occasion of this Memoir.

I regret having been unable to be present at the commencement of the sitting, for it was my intention to entertain the academy with the experiments published by M. Persoz, touching the decomposition of the acetates by means of the alkalies, and their conversion into carbonates and gas of marshes. I had foreseen this conversion in my Memoir on Chloracetic acid, but have only been able to realise it latterly. In the interval, the work of M. Persoz has appeared: it contains the same fact, of which I have had information by a letter from M. Persoz himself, which I received yesterday, and I hasten to render to the learned professor of Strasburg that which belongs to him.

As for the rest, in pursuing my experiments I have been for some days persuaded that alcohol yields, by the action of baryta, gas of marshes; that formic acid gives pure hydrogen; that it is the same with oxalic acid.

These facts I had foreseen; they agree with that which M. Pelouze has just related, as might be expected. They are discussed in the memoir which I am occupied in completing, and are applied to views perfectly in accordance with those which have actuated the investigations which preceded these.

ADDITION TO THE NOTE ON THE DECOMPOSITION OF ORGANIC SUBSTANCES BY BARYTA.*

BY MM. MILLON AND PELOUZE.

In announcing at the last sitting the formation of protocarburetted hydrogen by the decomposition of alcohol by the aid of baryta, we were bound to prove the composition of this gas, and the condensation of its elements. They are perfectly identical with the composition and condensation of the gas of marshes. Each volume of these two elastic fluids has for formula $C\frac{1}{2}H^2$, for both require, in order to burn, twice their volume of oxygen, and produce their own volume of carbonic acid.

The very little known properties of the gas of marshes, and especially the frequent cases of isomeria among the carburets of hydrogen, have induced us to pursue comparatively our investigations concerning the two preceding gases and that extracted from acetic acid.

We have remarked, in the action of bromine on the gas of stagnant water, and on that of alcohol, a great difference; the first is attacked very difficultly in diffused light, while the second is decomposed, under the same circumstances, with an extreme energy.

There has also seemed to us to be a perceptible difference, although less decided, between the gas of marshes and that extracted from acetic acid, so that there would be three gases composed and condensed in the same manner, but presenting different properties, or, in other terms, *three isomeric bodies*.

The action of bromine on the protocarburetted hydrogen of alcohol, gives rise to an etherial liquid whose composition is very far from what it ought to be, admitting the theory of substitutions of M. Dumas.

We have already interpreted in a manner entirely opposed to M. Dumas the resemblance which he had established between two reactions, one on acetic acid, the other on chloracetic acid. We add that we have arrived, to interpret these reactions, at conclusions which might be deduced not only from the experiments which we have reported in our Note, but also from the experiments of former chemists, when they burned carbon with hydrate of potassa; from those of M. Chevreul, when he obtained pure hydrogen by the action of the alkalies

* *Comptes Rendus*, No. 3, January, 1840.

on ligneous bodies; from those of M. Gay Lussac, when he destroyed several organic substances by potassa; and, lastly, from the experiments of which M. Persoz has given a recapitulation in his *Introduction à l'étude de la Chimie moléculaire*. Remarking that all organic matters were decomposed by a great excess of hydrate of potassa, giving birth to pure hydrogen, M. Persoz has pointed out this means as susceptible of being applied to elementary analysis.

Finally, Drs. Austin and Higgins observed about half a century ago, the formation of gas of marshes, or at any rate of a gas isomeric with it, in distilling acetate of potassa.

ON THE ESSENCE OF TURPENTINE AND ARTIFICIAL CAMPHOR.*

BY MM. SOUBEIRAN AND CAPITAINE.

MM. Soubeiran and Capitaine presented essays on essence of turpentine and artificial camphor. "It has been long known that essence of turpentine furnishes with hydrochloric acid a solid compound called artificial camphor. But this subject had not been sufficiently studied. These are the results obtained by MM. Soubeiran and Capitaine:—

"1st. Hydrochloric acid, in acting upon the essence of turpentine, furnishes two different compounds: one is the ordinary artificial camphor; the essence which is found in it (the camphene of M. Dumas) has retained its primitive rotatory power; the other combination is liquid. It contains a portion of essence which has experienced, under the influence of the acid, a modification which has left its chemical composition and capacity of saturation, but which has deprived it of the property of giving a solid camphor. This modified essence, which will be called *peucylene*, possesses, in liquid camphor, a weaker rotatory power, than that of the volatile oil of turpentine.

"2nd. When the solid camphor of turpentine is decomposed by lime, a peculiar oil is extracted from it, which M. Dumas considered as the essence of the turpentine itself. The name of *terebene* has been given to it. This terebene has the same density in the liquid state, and state of vapour, as essence of turpentine; its point of ebullition is the same. It is formed from the same elements, carbon and hydrogen united in the same proportion; but terebene is no longer essence of turpentine: it has no more rotatory powers. This terebene combines with hydrochloric acid and reproduces a solid camphor, which might be taken, from its characters and chemical composition, for camphor of turpentine; but, what is remarkable, this camphor has not the power of deviating the rays of polarised light.

"3rd. Liquid camphor of turpentine, or hydrochlorate of peucylene, has the same chemical composition as solid camphor. From it may be extracted, by means of lime, a kind of volatile oil, which presents the greatest analogy of characters with terebene and with essence of turpentine. This new oil, which will be designated by the name of *terebilene*, has an identity with terebene which is only deficient in a single point: terebilene does not yield solid camphor. It differs from essence of turpentine by its smell, and because it has no power of rotation.

"4th. Camphene, terebene, peucylene and terebilene, present to us the remarkable series of four chemically isomeric bodies, formed from the same elements, united in the same ponderal proportion, having a common capacity of saturation, a similar atomic weight, and which, however, have each a peculiar molecular state. It is perhaps the most remarkable case of isomeria which the science yet possesses, for to the chemist terebene is absolutely the same body as camphene; he finds the same identity between peucylene and terebilene. Chemistry is unable to distinguish them. However, in these bodies, the interior constitution of the particle is not the same; since they have not the same action on polarized light. Who can tell in what the difference consists?"

After the reading of this communication, M. Biot added that MM. Soubeiran and Capitaine had been kind enough to make him a witness of almost all the results which they had just announced, and that he had thus been able to convince himself of their accuracy. He accompanied this declaration by the following remarks:—

"Seeing the number of isomeric bodies daily augment, we are led to inquire whether chemical analysis might not omit some of the elements necessary to the molecular constitution of bodies. If such an omission exist, the extreme precision of the processes of weighing now employed must necessarily limit it to some principle of a density sufficiently weak to escape our balances. Now, as the principle of heat intervenes with great power in the composition and decompositon of bodies formed of dissimilar matters; it becomes natural to examine by experiment whether there be not left in isomeric substances some trace of its presence and its action, which would be dissimilar; in as much as a crowd of physical considerations tend to make us believe that

* *Journal de Chimie Médicale, Jan.* 1840.

this principle is indeed an essential and important element of material bodies.

"The first trial to be made to arrive at this conclusion, that which seems to present itself before every other, would consist in measuring comparatively, with much care, the specific heats of isomeric substances, to ascertain whether they are equal or unequal in every given case of isomeric. The result of this trial, be it what it might, would be profitable to science; for equality of specific heats would add still a new character of identity very intimate with that which these substances already present, and their inequality would at least reveal a dissimilarity of action in one of the most active principles of their formation. Not having either the means or the forces necessary to carry on such a work, M. Biot thought he might be able with some utility to point out the important consequences which might arise from it, and to urge its accomplishment."

M. Dumas replied, and remarked on this occasion, that to his personal knowledge, the question raised by M. Biot had already been made the subject of a great number of experiments on the part of M. Regnault, one of the most commendable of our young chemists, as well for the depth of his views as for the precision of his experiments. This remark, the object of which was favourable to him, was supported by M. Arago, Gay Lussac, Thenard, Elie de Beaumont, who, like M. Dumas, knew of the operations of M. Regnault.

INVESTIGATIONS CONCERNING THE CAMPHOR OF TURPENTINE.*

BY M. DEVILLE.

M. Dumas read, in the name of M. Deville, a note on the essence of turpentine.

The author finds that essence of turpentine furnishes two evils which have the same chemical composition, the same density in the liquid state and in the state of vapour, as well as the same point of ebullition. They have both the same affinity for, and combine with hydro-chloric acid, but their combinations are not equally stable, the one of them, which furnishes the solid compound known by the name of artificial camphor, is more difficult to be separated from the acid than the other, which produces with hydrochloric acid a liquid compound.

M. Deville has remarked that the essence of raw turpentine, treated by hydrochloric acid, furnished the two combinations which have just been noticed, as everybody knows; but he adds that, when the uncrystallized portion is separated from the first crystals obtained, and exposed to the air, new crystals are formed, and that by repeating this experiment several times, nearly the whole of the essence is converted into crystallized artificial camphor.

The author having treated essence of turpentine by sulphuric acid and peroxide of manganese, ascertained that the greater part of the essence was transformed into nonvolatile products; but an oil was volatilized, and it was precisely the oil which produces a liquid camphor, as the author had foreseen.

In treating essence of turpentine by chlorine, the author procured a compound whose formula was $C^{40}\ H^{34}\ \overline{Ch}^{8}$, conformably to the theory of substitution. By treating in the same manner the portion of the essence which makes a liquid camphor, a body is obtained isomeric with the preceding, and less stable than it.

The author has also studied the action of heat on the compounds which chlorine forms in acting on essence of turpentine, or on the part of the essence which forms a liquid camphor.

M. Dumas remarked that the product $C^{40}\ H^{34}\ \overline{Ch}^{8}$ is precisely the compound which he had obtained in treating oil of artificial camphor or essence of turpentine by chlorine. This analysis had not been published. M. Dumas has seen, moreover, that in prolonging the action of chlorine with heat, the compound of which we speak is changed into another crystallized camphor. He has not analysed it.

ON THE FORMATION OF THE ESSENTIAL OIL OF MUSTARD.†

BY M. BUSSY.

It results from these investigations that there exist in the farina of black mustard two principles whose reaction under the influence of water gives birth to the essential oil. One is a peculiar acid which M. B. calls *myronic*. The other is a matter which much resembles albumen, and which he calls *myronine*. This acid is without smell, it exists in mustard in the state of myronate of potassa. Myronine is soluble in water, coagulable by heat, the acids and alcohol, like albumen and the emulsin of bitter almonds. Put in contact with a solution of myronate of potassa, it developes the smell of mustard, and the liquor submitted to distillation yields the essential oil. White mustard contains myronine but not myronic acid, whence it arises that alone it cannot develope the essential oil. The properties of myronine perfectly explain

* *Journal de Chimie Médicale*, Jan. 1840.

† *Journal des Connaissances Médicales*, January, 1840.

why boiling water is opposed to the developement of the oil and cannot be employed to make sinapisms.

EXAMINATION OF THE SEEDS OF BLACK AND WHITE MUSTARD.*

BY MM. BOUTRON AND FREMY.

We know that, when the farina of black mustard is treated by cold or tepid water, a certain quantity of volatile oil is instantly produced. If, on the contrary, this seed is submitted to the action of alcohol at 40°, when the dried cake is taken up again in water, or the product of the evaporation of the alcohol, volatile oil is never produced. It is also known, indeed, that the seed of black mustard, treated by water acidulated with sulphuric acid or alkalised by potassa, does not yield it. These curious facts were announced in 1831 by MM. Robiquet and Boutron, and by M. Fauré.

The beautiful experiments of MM. Liebig and Wöhler concerning the action of the emulsin of sweet almonds on amygdaline, have caused us to suppose that by analogous means we might explain the formation of the volatile oil of mustard. Our investigations have been directed to this end, and we can now announce to the Academy that our attempts have been crowned with ample success.

We have ascertained, indeed, that black mustard contains a peculiar principle, analogous to emulsin, which constantly determines the production of the volatile oil. This principle is soluble in water, and is coagulated at 70° or 80°; it is precipitated in the form of whitish flakes, when alcohol is poured into the aqueous solution at 40°. Thus rendered insoluble by alcohol and heat, it is not fit to form essential oil. Sulphuric acid and potash have an action upon it analogous to that of the agents which we have just mentioned. These properties show us why mustard seed does not give rise to the formation of volatile oil when treated by alcohol, sulphuric acid and potassa, or when slightly torrefied.

If the cake of black mustard exhausted by the alcohol be treated with boiling water, a very bitter matter is then dissolved, completely inodorous, and which enjoys the singular property of yielding much volatile oil when put in contact at the ordinary temperature, or, better, at that of 30° or 40°, with the kind of emulsin just mentioned. These facts give then an explanation of the phenomena which, hitherto, remained without solution, and should now place mustard on a parallel with bitter almonds.

White mustard ought also to fix our attention, for, although congenerous with black mustard, it nevertheless presents the most decided differences. It is known, indeed, that this seed never yields essential oil, but that it furnishes an acrid principle when digested in cold water; it is also known that, when treated by alcohol at 38°, it leaves by evaporation a crystalline substance which has been named *sinapisine*. We have ascertained that it is this sinapisine which, under the influence of the emulsin, is transformed into a bitter principle. The acrid principle is not the only one which is formed in this reaction; we believe that there is also produced hydrosulpho-cyanic acid, which has been met with by M. Pelouze in his investigations concerning mustard. If this fact be confirmed, it will form a new point of resemblance to the experiments of MM. Liebig and Wöhler, who have discovered that when emulsin is made to react upon amygdaline, hydrocyanic acid is formed.

We have seen, indeed, that the emulsin of white mustard obtained cold, reacts upon the inodorous matter of the black mustard in such a manner that volatile oil is instantaneously yielded; and we have in vain sought this property in the other emulsive seeds, and especially in sweet almonds and linseed.

* *Journal de Pharmacie*, January, 1840.

IRON PRECIPITATED BY ZINC.†

BY M. CAPITAINE.

To obtain iron by the humid way, it suffices to plunge zinc into a solution of protochloride of iron as neutral as possible. A short time is sufficient, especially if the liquor be brought to boiling, in order that the zinc may become brittle and attractable by the magnet, and by prolonging the immersion nothing more than a friable fragment of pure iron is found. However, as it might be feared that there might still remain a little zinc unattacked, he has devised a contrivance, which is very simple, to avoid this inconvenience. It consists in immersing in the solution of iron a sheet of copper perfectly freed from verdegris and soldered by one extremity to a piece of zinc. It is something like the apparatus employed to obtain the arbor Saturni, and doubtless acts in the same manner. The iron is deposited upon the copper in a thin and friable bed, endowed with a metallic lustre, but not presenting any indication of crystallisation; this manner of operating has no other inconvenience than its slowness; but in whatever manner it may be performed, there is always observed a disengagement of hydrogen which lasts as long as the metallic precipitation.

† *Journal de Chimie Médicale*, Jan. 1840.

INVESTIGATIONS CONCERNING PECTINE.*

BY M. POUMARÉDE.

This chemist communicated some results at which he has arrived in the course of investigations concerning the chemical composition of vegetable tissues.

From the facts exhibited in his note, and from several others which he has since proposed to show, he thinks he may conclude:—

First. That the matter which has hitherto been called *Pectine* is an organised tissue;

Secondly. That the cellular tissue of fruits, of roots, of stems and of barks, is no other than this pectine.

Thirdly. That pectic acid does not pre-exist in plants, but is a product of reactions; indeed, that colouring matter is entirely foreign to this substance.

ANALYSIS OF PROSTATIC CALCULI.†

BY M. BONNAMY, PROSECTOR TO PROFESSOR CRUVEILHIER.

These calculi are in great number; the largest present about 1 centigramme; their surface is polyhedric, and what is remarkable, exposed to the air, from being transparent, they become tarnished, and reduced to dust.

After having pulverised these calculi, 1 decigramme was weighed out, which was introduced into a matrass with distilled water; it was heated for some time, then filtered; the filtered liquor was evaporated at a gentle heat, the residue was hardly discernible; it was yellowish; reddened blue turnsole paper perceptibly. This residue was soluble in nitric acid; the matter evaporated to dryness leaves a lemon-yellow residue; this yellow matter, treated by potassa, becomes reddish, afterwards almost violet.

Another decigramme was weighed, which was treated by alcohol; the alcoholic liquor was evaporated at a gentle heat, the residue, which was scarcely perceptible, presented the same characters as the aqueous solution.

Lastly, 1 decigramme was again taken, and incinerated in a small platinum capsule; the matter was carbonised, afterwards became greyish, and lost by incineration 2 centigrammes; there was then in earthy matter 8 centigrammes. This earthy matter caused a slight effervescence by being dissolved in hydrochloric acid. It is chiefly composed of phosphate and carbonate of lime.

According to these experiments, the calculi examined by us appeared to contain the same matter as those examined by M. Laugier; but their characters, based upon the action of azotic acid and potassa, do not seem to me to belong only to xanthic oxide. It is very well known that all azotic bodies treated by azotic acid give rise to an acid very little known, nitro-picric acid, which, by combining with potassa, yields a salt whose concentrated solution is almost as red as blood. We wished to ascertain whether nasal mucus, saliva, the nails, albumen, and hair, would not exhibit the same property.

For that purpose, we took some dry nasal mucus; we put it in contact with cold distilled water; afterward it was filtered. A transparent liquor passed off by filtration, which yielded very sensible traces of acidity after its evaporation, and which, treated by azotic acid and evaporation carried on to siccity, took a beautiful yellow colour, which became almost as red as blood by potassa.

The insoluble part of mucus treated by azotic acid presented the same characters, only with a much greater intensity; hair, the nails, and saliva, exhibited the same characters, but albumen is the substance which presented them in the most decided manner.

According to these experiments, xanthic oxide ought only, in our opinion, to be regarded as mucus or albumen, if it is admitted with certain authors that its distinctive character is its yellow coloration by azotic acid, and the red coloration of this yellow matter by potassa.

ANALYSIS OF THE SUBSTANCE OF THE BRAIN.‡

BY M. PELOUZE.

M. Pelouze made known the results of some interesting researches undertaken by M. Frémy concerning the chemical composition of the cerebral substance; instead of the five different matters remarked by M. Couerbe, M. Frémy finds the cerebral substance a very simple composition; it results, according to him, from the union of soda with two new fat acids, thus forming a true soap; M. Frémy has, moreover, recognised the presence of the cholesterine noticed by M. Chevreul; but he has found sulphur only in the albumen which forms part of the brain.

* *Journal de Chimie Médicale*, Jan. 1840.
† *Journal de Chemie Médicale*, Jan. 1840.
‡ *Journal de Chimie Médicale*, Jan. 1840.

II. CHEMICAL MANUFACTURES.

INVESTIGATIONS ON COLOURING MATTERS, AND ON BLEACHING.*

BY DR. ROBERT KANE.

Addressed to M. Dumas.†

" ..... I had intended to explore, by a complete work on colouring matters, the primitive, and generally colourless condition of these matters in plants, to determine the laws which govern their successive alterations, and to determine the mode of action by which they are destroyed by oxygen or chlorine, which would present the theory of bleaching. I have already arrived at some results.

" I am persuaded that, in the bleaching action of chlorine on colouring matters, there is, as in other organic bodies, a subtraction of hydrogen, and a formation of a new substance which contains chlorine: it is a true case of substitution.

" From this it results that the old theory of bleaching, which consisted in saying that chlorine acted by decomposing the water, and setting free the oxygen, is false; if dry chlorine has but a weak action, it is on account of its gaseous state. The same as by making oxygen or chlorine act upon alcohol, we obtain two series which terminate in acetic and formic acids; by employing a coloured substance, we obtain nearly similar results; but as the new matters are in general colourless, the process is called bleaching.

" I have not been able by any process to procure the erythrine of Heeren. I have obtained in great quantity the substance which he has called pseudo-erythrine, and have determined its constitution and properties. This body does not combine with bases, but yields by decomposition two substances: the first is *saccharoïde*, the identity of which with orceine I have not been able to determine; the second is the bitter of erythrine; they yield orceine by the concurrence of oxygen and ammonia.

" I have analysed many compounds of orceine with the oxides of copper, silver, and lead. The state of azote in orceine is a point of great theoretical interest. I think that it exists in it in the state of amidogen, and that the compounds of orceine with bases resemble those complex metallic amidurets or amidides, of which I have shown so many examples.

" I have been led to form this opinion by the manner in which chlorine acts upon it; the reaction is interesting, because it applies the general mode of the action of chlorine on organic substances to the phenomenon of bleaching. Orceine is not decoloured by chlorine. Azote is eliminated in the state of sal ammoniac, and a violet-coloured substance, insoluble in water, is formed, to which I have given the name of *chlororceine*. But orceine may be decoloured in another manner: if a piece of zinc be put with a little acid into a solution of orceine, it is decoloured by the nascent hydrogen, and a matter is formed which I

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* *Journal de Chimie Médicales*, Jan. 1840.

† All chemists are aware that our learned brother, M. Robiquet, has long since demonstrated the important fact, that the colouring matter of the archilla of commerce pre-exists under the form of a saccharine and colourless matter, which has been designated by the name of *orceine*, and concerning which Dr. Kane has just made some interesting observations. They will also call to mind the investigations concerning turnsole, which science owes to our illustrious president, and which the analyses of Dr. Kane tend to complete.

I will also call to mind that, among the facts which Dr. Kane's letter contains, there are two which are confirmed beforehand by my own personal investigations. I have indeed published analyses which prove that blue indigo passes to the white state by the removal of its hydrogen. Moreover, I have long since produced and analysed the matter into which indigo is transformed under the influence of chlorine. Far from being decoloured, as is generally supposed, indigo is converted into a matter of a beautiful red colour. This conversion is performed by the ordinary process, namely, the chlorine displaces the hydrogen, and takes its place in such a manner as to constitute a new chlorated matter, or rather a chlorate body belonging to the same type as indigo.

I have shown, described and made known this matter in my public courses for several years; and I should be inexcusable in not having published my observations, if there had not remained some doubts concerning the formula of the red matter, and if those doubts did not arise from a cause which I have not hitherto been able to overcome, namely, the presence of a little sulphur in the indigo prepared by the sulphate of iron and lime, as in ordinary. Whence result some traces of chloride of sulphur with which the red matter remains impregnated, and which always affects a little the dose of chlorine.

have called leucorceine, which gives white lacs.

"Sulphuretted hydrogen yields with orceine a colourless compound, which cannot be obtained in the solid state; it is the same with the purple compound produced by ammonia.

"When orceine is put in the conditions which determine the conversion of raw lichen into coloured archilla, and when it is decomposed, the result is the carrying away of all its azote with hydrogen, oxygen and carbon, forming together an ammoniacal salt: there results from it a substance to which I give the name of *erythroleic acid*. It is a semi-fluid unctuous substance at the ordinary temperature. It does not contain azote. Its solution in ether is of a beautiful binous red; ammonia renders it *purple*. This substance exists in the archilla and turnsole of commerce.

"The turnsole of commerce contains two principles; the first is soluble in alcohol, and in water, the second is insoluble. The soluble part consists of an acid which I call *litmic acid*; it is combined with ammonia and potassa. The insoluble part is composed of litmic acid in small quantity, but in part of another acid which I call litmylic, and besides erythroleic acid, united to lime, and mixed with a great quantity of clay, gypsum and other foreign matters. I have examined many salts formed by these new acids, and have completely determined their characters and formulæ. Litmylic acid contains the same quantity of carbon and hydrogen as erythroleic acid; it only contains more oxygen. But in litmic acid, half the hydrogen of litmylic acid is replaced by oxygen.

"These acids of turnsole, which are red in their natural state, turn blue with alkalies, and form blue or purple metallic salts; but they are singularly unstable. The blue compounds of ammonia, instead of being well-characterized salts, lose all their ammonia at the temperature of 100° Cent. Indeed, I am disposed to think that the metallic oxide in these compounds replaces the water of constitution and not the basic water, and for this reason they may be removed by very feeble affinities.

"A very curious property of litmic acid confirmed me in this view. If litmate of lead is treated by sulphuretted hydrogen litmic acid remains combined with the sulphuret of lead, and can only be separated from it by means of a soluble oxi-base with which it combines in preference. We have then classes of bodies which, representing litmic acid by L, are composed L + HO, L + HAZ, L + HS, L + PBO, L + PBS, &c. This more resembles the substitution of the water of hydratation than the basic water. If it were thus, the names of lithmine and lityline would be more proper.

"The action of chlorine on these compounds produces two bodies to which I have given the names of *chloro-litmine* and *chloro-litmyline*; they are of a yellowish brown, but this case is analogous to the phenomena of bleaching: I have analysed their combination with the metallic oxides, and have determined their constitution. I have obtained *leuco-litmine* and *leuco-litmyline* by nascent hydrogen; but I have not been able to isolate them in a state to allow of their analysis. I have not found that the process of Desfosses, to obtain decolored turnsole by protoxide of iron, is useful.

I am persuaded that in these cases of decoloration, the effect is not produced by a subtraction of oxygen, but rather by the addition of hydrogen, as has been found in the conversion of blue indigo into white. I regard the evidence on this point as perfectly complete.

"I call *atmerythrine* a very remarkable body, discovered in the course of my investigations. It is volatile; its vapour is of a brilliant red, as its name indicates. It is condensed under the form of brilliant bracteæ, which melt easily and are of a greenish red. It is soluble in alcohol, insoluble in water. It is not formed when litmate or litmylate of lime are slowly heated, or rather these acids mixed with lime or gypsum. No trace of atmerythrine is obtained by heating alone litmic and litmylic acids. It is probably a product of decomposition, which, without doubt, has the same relations as acetone has with acetic acid. I have never been able to obtain enough of it to submit to analytical investigations.

"To separate and distinguish the three matters of turnsole, suffice it to say, litmic acid is soluble in water, very little soluble in alcohol, and insoluble in ether. Litmylic acid is easily dissolved in alcohol, but very little in ether and in water; while erythroleic acid is almost insoluble in water, but readily soluble in alcohol and in ether."

ON THE USE OF THE STRIPS OF PLATE BORDERING THE SHEET FOR RECEIVING A PHOTOGRAPHIC IMAGE BEFORE EXPOSING IT TO THE VAPOUR OF IODINE.*

EXTRACT OF A LETTER FROM M. DAGUERRE.

The author commences by making known several processes which he had formerly put in practice, with the view of determining an equal distribution of the iodine throughout the extent of the plates destined to receive photographic images; and after having

* *Comptes Rendus*, No. 3, Jan. 1840.

pointed out the reasons which have led him to prefer the employment of languets in the metal, he adds:

"The following experiments have convinced me that it is indispensable that these strips be of the *same nature as the plates:*

"1st. In turning the strips, that is to say in putting the copper uppermost, the edges of the plate were surcharged with iodine:

"2nd. In substituting for the metallic strip, strips of glass, the bed gains the same in intensity on the edges:

"3rd. In covering some parts of the strips of plate with gum lac, the same effect takes place in the parts where the bed of gum lac is met with, and terminates immediately at its side:

"4th. In employing strips of platinum instead of sheets of silver, the bed still increased upon the edges:

"5th. In keeping the strips on the card-board, the effect was the same.

"Without the difficulty of fixing them, the bands," further says M. Daguerre, "might be reduced to the size of 3 millimetres; for it is sufficient, for them to produce their effect, that there be solution of continuity between them; and what proves it is, that nearly the same result was obtained by engraving, at 3 millimetres from the edge of the plate, a sketch deep enough to reach the copper. Although this means might substitute the strips, I have not pointed it out in my description of photographic processes, because it presents inconveniences. At length, during the cleansing of the plate, the incised engraving is filled with coal-dust or tripoli, and afterwards, in washing, it retains some water which occasions stains.

"This is," pursues the author, "a recent experiment, which gives nearly the same results as the strips; although this may not be practicable, I here give it as a good fact to be proved; in disposing round the plate, laid flat, a border, either of pulverised starch, or lime, and allowing the vapour of iodine to descend upon it by means of the little saturated board, the starch, and better still the lime, absorb the iodine with avidity, and the layer is very regularly distributed.

"I will add a few words concerning my last apparatus for iodizing the plates. Every one may judge of its great simplicity, since it consists merely in a little box containing two grooves, one to receive an iodized plate, and the other for the little board upon which the plate is fixed. But it is not known that it is unnecessary to renovate every time the plate supersaturated with iodine, for once impregnated, it may serve not only a whole day, but several days in succession without being again renovated in the iodizing box; the promptitude is not very sensibly relaxed, provided, however, that the iodised plate be kept in the little box with grooves in it.

"If the effect were too rapid, it might be retarded in two manners; either by making in the box a third groove, to remove to a distance the little board (which does not complicate the apparatus), or by turning the box to let the vapour of iodine descend, which relaxes the effect two-thirds. But I am not yet certain that the vapour of iodine, in descending upon the plate, is arranged on it in the same manner as in rising, and that the layer thus obtained is as favourable to the reproduction of the image and the arrangement of the mercury."

ON THE IODURATION OF METALLIC PLATES FOR RECEIVING IMAGES, AND ON THE USE OF THE STRIPS OF PLATE WITH WHICH IT IS CUSTOMARY TO SURROUND THEM.*

NOTE OF M. SEGUIER.

Wishing to assure myself by experiments, of the part which the little strips of silver plate perform with which M. Daguerre advises, with reason, the plates of metal to be surrounded at the moment when they are submitted to the vapour of iodine, I perceived that these little strips act by preserving the edges of the plate from the radiation of the iodine accumulated in the sides of the boxes in which the operation is performed.

It is important then, in order that they may produce their effect, that they be cleaned at each operation, for when they are covered with iodine, they no longer stop in its passage the iodine radiating from the sides towards the plate of metal.

Two means are presented to avoid the inconvenience of excess of iodine on the edges of the plate: it is necessary, either to withdraw the plate from the radiation of the sides, or to prevent the sides from being charged with iodine.

I stopped at the following method. A box of hard wood, varnished internally with gum lac, contains a lump of soft wood furnished with a card of cotton sprinkled with iodine. Upon this is placed a little plate covered with card-board on each of its faces. One of these card-boards furnishes by radiation to the plate metal the vapour of iodine, while the other returns to the cotton that which it had lost. It suffices to turn the plate from time to time in order that the operation may be continued with the same rapidity.

A plate of glass is placed upon the upper card-board, where it is not operated on. Two little frames of hard wood, var-

* *Comptes Rendus*, No. 1, January, 1840.

nished with gum lac, one of a centimetre, the other of two centimetres in height, serve to sustain the plate above the card-board charged with the iodine.

By employing only one of these frames or combining them, three distances are obtained; thus, that may be chosen which best suits the state of the heat of the atmosphere. In summer the operation would proceed too quickly at the distance of one centimetre; the two frames put one upon another will give a distance of three centimetres, which is very convenient for this season.

In winter, on the contrary, the frame of two centimetres or even that of one, will operate with facility and promptitude.

M. DAGUERRE'S PROCESS.*

BY M. G. BAYEUX.

A plate of copper silvered over is taken, which is carefully scoured with dilute nitric acid, this scouring being with the view of entirely freeing the surface of the silver from all foreign matters which might be attached to it, and to render even this surface more level. Afterwards the several operations pointed out by M. Daguerre are proceeded with, and which I will divide, in order to explain them in a clearer manner.

First Operation.—The silvered side of the plate is submitted, in a closed box, and sheltered from all light, to the action of the vapours of iodine produced by a small quantity of this element, which had previously been placed in the bottom of the box, and which is gently heated; this vapour passes through a fine and light gauze, which sifts it and spreads it uniformly on the surface of the metal; the iodine combines with the silver, and forms with it a light layer of iodide of silver which is extremely thin, since in the pictures exhibited by M. Daguerre it only equalled a millionth of a millimetre in thickness.

Second Operation.—This plate is afterwards transported, without undergoing the action of light, into the camera obscura, in the focus of which it is placed; the light then acts upon the iodide of silver, which is totally decomposed in the parts struck by the luminous rays; it is only partly so in the parts which, although in the shade, are however illuminated by the reflected light; indeed it remains intact in the parts entirely in the shade; in this decomposition the iodide of silver is changed into reduced silver, which has neither the colour nor metallic lustre of ordinary silver on account of its extreme division.

Third Operation.—The plate is next submitted to the slow action of mercurial vapours, excited only by a temperature of 75 centigrade degrees; the mercury is united to the reduced silver, forming an amalgam of silver, while it is without action on the iodide of the same metal: there is then formed in the parts which have been struck by light, an amalgam of silver, which is white, and which is so much the less mixed with iodide of silver as the parts have been more subjected to the action of light: there the drawing commences to appear in which the shades are marked by more or less iodide of silver, according to their intensity.

The operation succeeds better, according to M. Daguerre, when the plate receives the vapours of mercury at an angle of 45°, than if it were placed parallel with the surface of the mercury. I think that in this case the action is purely mechanical, and that if it did not succeed in the supposition of parallelism, it is because the vapours of mercury, which are extremely heavy, and which, besides, have no current, would remain stagnant, and would be more difficultly combined; while under an angle of 45°, the vapour glides against the surface of the plate, and combines with it more easily, since it is renewed quicker.

Fourth Operation.—The drawing is then plunged into a solution of hyposulphite of soda; then the plate acts as an element of the Voltaic pile would do, and decomposes a portion of the water of the solution; the hydrogen of this water is carried to the iodine, forming hydriodic acid, while the oxygen is absorbed by a portion of the hyposulphite of soda which passes to the state of sulphite of the same base; the hydriodic acid which is free, reacts upon another small portion of hyposulphite of soda which it decomposes, seizes its base, forming with it hydriodate of soda, liberating a small quantity of hyposulphurous acid; but this, as is known, cannot exist free, it is therefore decomposed as soon as it is separated from the soda, into sulphur and oxygen; the oxygen is absorbed by a third portion of hyposulphite of soda, while the sulphur is united to the silver, forming a sulphuret of silver, which substitutes on the plate the iodide which existed there previously, and which is thus met with on the parts in the shade. This fourth operation is evidently much more difficult to explain than the others; however, this theory appears to me the simplest and most natural, in as much as it explains why the copper, plated with silver answered better than silver alone.

The washing with distilled water which it is made to undergo in the last place, is only with the view of removing all the solution of hyposulphite of soda which might remain upon the picture, and render it less clear.

* *Journal de Chimie Medicale*, Jan. 1840.

Thus, in the first stage of the operation an iodide of silver is formed upon the surface of the plate:

In the second, light decomposes this iodide, and returns the silver to the metallic state without lustre, on account of its division:

In the third, the mercury forms an amalgam with the reduced silver, and commences to make the parts appear which were struck by the light:

Lastly, in the fourth, the contact of the hyposulphite of soda changes the iodide of silver of the shaded parts into sulphuret of silver, which is black, and not attackable by light; whence results the formation of the shades and the fixation of the drawing.

This is, in my opinion, the theory of M. Daguerre's process, which at first sight appears very confused, but which on reflection is easily understood.

ON THE REFINED CASHOO OF COMMERCE.*

BY MM. J. GIRARDIN AND F. PREISSER.

The note published by M. H. Reinsch, on the artificial preparation of brown cashoo (see *The Chemist*, No. I. p. 21) induces us to make known a kind of fraud which druggists commit with respect to cashoo, since this substance has been ranked among tinctorial matters. If tradesmen would be contented with converting yellow cubic cashoo into brown cashoo by fusion, less blame would attach to them, for these two kinds of cashoo have nearly the same tinctorial qualities. But what is truly blameable, is the introduction into brown cashoo of an insoluble and inert matter, which causes a great pecuniary disadvantage to the manufacturers who make use of this juice as colouring or tanning matter.

Since 1836, the epoch of the greatest consumption of cashoo in dye-houses and calico manufactories, the druggists of Paris have sent to Rouen a new kind of cashoo, under the name of *refined cashoo*, whose external appearance sufficiently indicated that it was the result of French manipulation. This product is in pieces of a brown tint, a smooth and glossy surface, flattened, with mossy edges, and appearing to have been drawn in the form of a semi-fluid extract, on a plan by which they were at once cooled and hardened. These pieces, of the weight of 500 grammes several kilogrammes, have a vitreous cassure of a reddish-brown, a very bitter and astringent taste, and adhere very firmly to the papers which cover them.

In 1837, a dyer of Rouen brought us a sample of this *refined cashoo*, begging us to tell him if it were really purer than the *brown cashoo extracted from the leaves* of colcutta which he exclusively employed in his manufactories. The experiments which we made on this occasion apprised us that it contained 40 per cent. of a foreign matter. This is the manner in which we detected this fraud.

Far from almost completely dissolving in warm water, weak alcohol and acetic acid, in the same manner as pure cashoo, the so-called *refined cashoo* left a residue nearly equal to half its weight, pulverulent and of a deep black, which disengaged upon coals a strong smell of animal matter, and which, by calcination in close vessels, gave abundant ammoniacal vapours.

This residue coloured an alkaline solution brown; by an ebullition of some minutes in a solution of potassa, it was almost completely decolored, but it increased considerably in volume, and by continuing the boiling, quite disappeared.

Hydrochloric acid dissolved part of this residue, by the aid of heat, taking a dirty brown colour and acquiring a viscous consistence; the undissolved part presented a much more considerable volume than the powder put in contact with the acid.

Acetic acid and alcohol removed but a small portion of the colouring matter.

Ammonia was coloured a deep brown, and by repeating upon the residue the action of this alkali, it concluded by removing all the colouring matter, and left no more than a greyish filamentous matter, which possessed all the characteristics of fibrin!

It is evidently not fibrin which is added to the refined cashoo; every thing has shown us that it is dried and pulverised blood, which is introduced into the extract a little before casting; it is indeed the only substance which presents the characters we recognized in the insoluble residue of the refined cashoo, and whose colour so much resembles that of brown cashoo, that it would be difficult for the eye to detect its presence.

This fraud is not only prejudicial to the consumer, by the pecuniary loss which he sustains from the purchase of a matter inert in dyeing; there is, moreover, the serious inconvenience of introducing into the vats a substance which retains obstinately a great part of the colouring principle of the cashoo; this substance is fibrin, which, we are assured by direct experiments, possesses a decided affinity for colouring matters; whence it follows, that in making use of the *refined cashoo*, not only is all the portion of the product represented by the dried blood lost, but also much of the colour which remains combined with the fibrin. Thus it is not 40 per cent. of residue which remains at the

* *Journal de Pharmacie*, January, 1840.

bottom of the vats, but 60 or 70 per cent. And indeed the cashoo added to blood scarcely colours boiling alcohol; so energetically does the fibrin retain the colouring principle of cashoo.

We will say, in conclusion, that good cashoo extracted from the leaves of colcutta is dissolved in boiling water, leaving only a weak earthy residue, equal to 3 per cent.; that it only contains 11 or 12 per cent. of matter insoluble in boiling alcohol, a matter entirely formed of salts and gum; indeed, that it only gives by calcination 3 or 4 per cent. of ashes which are rather alkaline, but not ferruginous.

ON THE ALCOHOL WITHDRAWN FROM THE FULMINATES OF MERCURY.*

The preparation of fulminates of mercury, which is commonly made on the large scale for the manufacture of primes, gives rise to a disengagement of vapours which much incommoded the workmen before the means of working in closed vessels was discovered. Now, not only are they defended from these emanations, but there is gathered an etherial alcoholic liquid, of a very complex nature, for it contains mercury, formic and acetic acids and their ethers, hypounitric and hydrocyanic acids, and some other bodies. After some fruitless attempts made to render this liquid useful, a manufacturer, M. Goupillat, has found a means, for which he has taken out a patent, of procuring from it pure alcohol; this means consists in saturating the liquid acid with chalk, and distilling the product separated from the solid residue.

Authority has been consulted to ascertain whether such products might be allowed to circulate in commerce without danger; M. Gauthier de Claubry, member of the Council of health, has made a report on this subject, and although he has acknowledged that pure alcohol might be thus obtained, as negligence in manufacture might allow hydrocyanic acid to pass into it and occasion accidents, it has been decided that it would not be sold in commerce without being perverted in such a manner that it could not be taken as a drink.

* *Journal des Connaissances Médicales*, January, 1840.

ON THE ADULTERATION OF WAX.†

BY M. BONNARD.

A sample of wax which appeared very impure was presented for the examination of M. Bonnard. He recognized, by dissolving it in essence of turpentine, that it contained sixty per cent. of fecula. He also employed, on this occasion, another means of analysis which succeeded equally well: he boiled a mixture of one hundred parts of water and two parts of sulphuric acid, and threw into it by small portions the adulterated wax; the acidulated water saccharifies the fecula, which remains entirely dissolved in it, while the purified wax may be gathered from the surface after being cooled, and weighed to ascertain the proportions of it.

† *Journal des Connaissances Médicales*, Jan. 1840.

III. PHARMACY, &c.

EFFECTS OF ALCOHOLIC DRINKS ON MOTHERS AND INFANTS.‡

BY A. COURTENAY, SURG., R.N.

I have resided in Ramsgate during nearly eight years, and have in that time attended 1,127 midwifery cases, and have invariably found that, other circumstances being equal, those mothers who never tasted malt liquors, wine, or spirits, during and subsequent to the period of labour, have had the easiest labours, the earliest recoveries, and the best health afterwards. Nay, more, I know several mothers who never could nurse their children, under the ale and porter system, without suffering greatly in health, but who, after relinquishing the use of those baneful stimulants, have experienced a perfect freedom from disorder during the period of lactation. Nor was this all. The offspring of such mothers have enjoyed an unprecedented immunity from disease also.

That some females do not feel their health disordered whilst using those drinks, I am ready to admit, and that their tender infants, also, may escape, for a time, with impunity, is certain, but that both mother and child suffer more or less, in proportion to the quantity of these drinks taken by the mother, at a remote period, if not at the immediate time, is to me as certain as that I am now writing. Nor do I see how it can be otherwise, according to the laws which govern the animal economy. Let any man

‡ From *The Lancet*.

in extensive practice, any man who is accustomed to reflect, review the state of health of the great majority of ale and porter drinking mothers during and after the period of child-bearing, and then say whether their health is what it should be had they lived according to nature's dictates. In affirming that it is not, the mass of disease that presents itself amongst this, the better part of created beings, strongly confirms the assertion. I have under my own eye many mothers who are experiencing the ill effects of the moderate (not the immoderate) use of these falsely-denominated "strengthening" beverages, in the form of liver and stomach complaints, skin diseases, asthma, dropsy, &c., and every impartial and observant member of the profession must have noticed similar results. Thousands of children are annually cut off by convulsions, &c., from the effects of these beverages, acting through the mother.

Strong drinks excite a feverish state of the body, and create an artificial thirst, — a thirst which is not expressive of any real want of the constitution, but a certain proof that the want does not exist. The greater the craving for them, under these circumstances, the more certain we may be that they are not needed, and that they will cause positive mischief to both mother and child. The constitutions of both are stimulated beyond what nature ever intended that they should be. The laws which govern the animal economy are positively infringed, and it is impossible that either mother or child can escape the penalty of that infringement. Both will suffer to a certainty in some shape or other; if not immediately, at a future period.

WATERY SOLUTION OF OPIUM IN VENEREAL EXCRESCENCES.*

M. Venot, of the Venereal Hospital, Bourdeaux, having been disappointed in the various remedies which he had employed for the treatment of venereal vegetations, determined to try the efficacy of the narcotic lotions, recommended by M. Desruelles. His experiments were most successful, and from them he draws the following conclusions:—

1. The solution of opium should be fresh and concentrated, an ounce of water containing at least one drachm and a half of opium.

2. The white dry epidermoid vegetations do not yield so readily.

3. All cases of mucous vegetations, moist warts, condylomata, &c., are almost certainly cured by the watery extract of opium, especially if employed after general treatment.

4. The local action of the remedy is manifested in the following manner: — the vegetations dry up, become pale, then yellow, brown, and finally waste away.

5. This action, which is evidently poisonous, may extend to the healthy parts and determine certain accidents, against which the physician must be on his guard.

* From *Gaz. Med. de Paris*, Jan. 1840, and *The Lancet*.

CORRECT VACCINATION, AND IMPEDIMENTS THERETO.*

[*As there is no more interesting object of Pharmacy than the Vaccine Virus, we have given insertion to this Paper.*]

In order that the subsequent observations may have a clear and definite meaning, we think it necessary to lay down plainly what we conceive to be required to render the process of vaccination as perfect as possible. We have been constrained to adopt this course from observing the great discrepancy that exists between the statements of different individuals with respect to its protecting power, which we are convinced could not have happened to such an extent, had uniformity of practice been followed.

From the commencement of this practice, efforts were made to ascertain when it had fully taken hold of the constitution, so as to afford reasonable hope of future security. The comparative mildness of the affection rendered this an important point of consideration, and up to this hour it has lost none of its interest. The only perfect test is that which arises from the insertion of the variolous lymph, but as that is on many accounts objectionable, it is better to find out, if possible, some other.

The first to which we would advert is the regular progress of the vaccine vesicle, and we would lay it down as an axiom never to be forgotten, that no one is qualified to speak of its effective character who has not, at suitable periods, noted this progress. The genuine disease can only be produced by pure lymph from a regular source. The time for taking this lymph according to Dr. Jenner, is between the fifth and eighth days, and before the formation of the areola. Others have recommended the use of lymph taken at a much later period; but this we believe to be a very questionable practice, and ought [which ought] never to be followed. It is very true that the affection

* From the Report published by the Provincial Medical and Surgical Association; in the *Medical Gazette*.

may be propagated by virus found in the scab, but this only succeeds [succeeds only] when active lymph is preserved in a dried state within the scales.

A test, dependent upon the successful progress of vaccination, was very early noticed by Dr. Jenner, and subsequently brought forward by Mr. Bryce, of Edinburgh. He proposed that some fresh vaccine lymph should be inserted into the patient a few days after the first vaccination. This practice was founded on the observation that the second vaccination proceeds with accelerated speed, provided the first has taken effect. It is a very simple and beautiful illustration of the constitutional effects of vaccination, and deserves to be encouraged. An experienced eye will for the most part be able to detect any deviation from the true vesicle. Unfortunately, the means of making correct observations are often denied to medical men, and anything that would secure greater attention to this branch of the subject would be of high value, and unquestionably would have prevented many of the failures that have recently taken place.

The second point demanding unvarying assiduity, is the character of the lymph employed. It never ought to be taken from a vesicle which deviates in the least degree from the perfect standard, nor from a patient labouring under any cutaneous disease. It is to be feared that these rules have not been punctually observed; and that deviations have been propagated, which afford varying degrees of security, according as they approach to or recede from the healthy character.

A third point which ought ever to be insisted upon, is the leaving one or more vesicles to run their course without being in any way disturbed. This canon was introduced at a very early period, but we have more than cause to suspect that it has been often defeated, either by the carelessness of parents, or the hurried manner in which vaccination is sometimes performed.

Another point on which perhaps too much stress has been laid, is the appearance of the cicatrix. It is true that after regular vaccination, it generally assumes an uniformity of aspect well known to medical men. The medical officers of the army and navy are compelled to rely a good deal on its appearance; and all recruits on whom it is supposed not to be perfect, are subjected to vaccination. The experience obtained from these services, is, so far as it goes, in favour of information derivable from this criterion. We are satisfied, however, that by itself it ought never to be absolutely trusted, and we must repeat here, what we have already observed, that nothing but a watchful inspection of the progress of the vesicle will justify any one in speaking with confidence of the security likely to be attained.

From all we can learn, we are inclined to believe that though the presence of a perfect cicatrix is not a sure sign of protection, its absence must be held to speak strongly against the existence of vaccine influence. The peculiar appearance of the cicatrix is caused by the reticulated or cellular structure of the vesicle. The same organization occurs also in variola. Now, if the vesicle has been repeatedly opened or broken, the ulcerative process that succeeds destroys the organization of the cells, and leaves a cicatrix nearly smooth, instead of the well-defined indented surface, which may for the most part be seen after complete vaccination. It may also be observed that many persons who have been extensively marked and seamed by small-pox have had subsequent attacks of that disease, proving that after perfect human small-pox, as well as after perfect cow small-pox, a second attack may occur.

Mr. Dodd, of all our correspondents, seems to have paid most attention to this part of the subject. Of fifty-seven cases that had been exposed to the contagion of small-pox and escaped, in six only was the cicatrix perfect; in fourteen it was slightly defective; in thirty it was very imperfect; and in seven it was totally wanting. Out of seventy-seven cases of small-pox after vaccination, one bore a perfect mark, fourteen had the cicatrix slightly defective, forty-seven were imperfect; and fifteen had none at all. Thus, to sum up the whole, out of one hundred and thirty-four cases of vaccinated persons who had been exposed to small-pox, the cicatrices of seven were perfect, and one of these failed; twenty-eight slightly defective, of which fourteen failed; seventy-seven very imperfect, forty-seven of which failed; twenty-two had no marks at all, and of these fifteen had small-pox, while seven altogether escaped.

Our correspondents amply justify us in laying down the foregoing principles; and we also think from the evidence before us, that vaccine lymph, though passed through a great number of subjects, and used for a great number of years, does not necessarily become deteriorated. This, however, can only be said when unceasing attention is paid to every successive transmission; for if a deviation commences, it may be perpetuated, and afford a gradually decreasing protection. There is no doubt that lymph of this kind has been often used. We have satisfactory illustrations of this truth from several of our returns. We will mention one out of many of this kind. Mr. Fox, of Cerne Abbas, thinks that more cases of small-pox have occurred after vaccination performed ten or twelve years, than after vacci-

nation performed thirty years ago, and that this arises from the extensive propagation of imperfect cow-pox, which only affords a diminished amount of security. A remarkable instance came under his observation a short time ago. A father and two children were inoculated with fresh small-pox virus from the same child, and at the same time; both children caught the disease, and the father escaped, though he had been vaccinated more than thirty years. It will be observed in subsequent parts of our Report, that failures are noticed at all periods from a few weeks after vaccination up to thirty or more years. It has been supposed that they are most common at and after the age of puberty; but this is certainly not the opinion of our correspondents in general. Some, it must be admitted, do affirm that small-pox has more frequently occurred in persons recently vaccinated than in those at a remote period, while others assert that time makes no difference.

The influence of cutaneous diseases on the progress of the vaccine vesicles is a point, too, demanding greater attention than it has hitherto obtained. At a very early period Dr. Jenner discovered that the affection was very much modified in its progress by the scaly tetter, and those affections described by Dr. Willan under the term *psoriasis*, as well as those vesicular eruptions commonly called herpetic. He observed that vaccination performed on a skin occupied by any of these diseases, "produces every gradation from that slight deviation from perfection, which is quite immaterial, up to that point which affords no security at all." We have seen the herpetic affection occupying the angles of the mouth, the upper portion of the lip near the nostrils, or the tender skin behind the ears, cause the vaccine vesicle to assume an incorrect form, containing an opaque fluid, with an irregular efflorescence of a dusky red colour. We have also seen similar irregularities commencing from a like cause, which completely disappeared on destroying the herpetic affection, by applying a little of the liquor plumbi. The case to which we at present refer, was under the immediate direction of Dr. Jenner himself. The premature and jagged efflorescence round the vaccine vesicle had appeared. He immediately detected the cause; and by the application above alluded to, destroyed the disease of the skin. In a very short time the deviation disappeared, and the vaccine affection subsequently ran its course in a regular manner. It does not uniformly happen that vaccination is thus impeded by the pre-existing cutaneous maladies; but wherever the disturbance is in the slightest degree manifested, the vaccination ought to be distrusted, and repeated as soon as the skin has been brought into a healthy state.—It is a very long time since these truths were impressed upon the public mind; but we have had many proofs that they are not yet sufficiently considered; it is, therefore, our duty to recall them. Dr. Jenner's last publication particularly refers to this point of practice; and we know that it caused him much disquiet that his admonitions and instructions were so little heeded.

Among those of our correspondents who have had most experience, and whose success has been most uniform, we find unequivocal testimony to the accuracy of Jenner's doctrine on this head. Many have made no observations at all respecting it; while some mention dentition, general ill state of health, scrofula, &c., as impediments to vaccination.

Other constitutional peculiarities stand in the way both of human small pox and cow small-pox. Some resist these affections at one period of their lives and not at another; and there are examples of the very opposite condition, which show that the individual will receive either infection as often as it is presented to him. These peculiarities frequently run in families. We know several children of the same parent, who have had modified small-pox after cow-pox; and not many months ago three brothers had small-pox after small-pox, one of these cases proving fatal. On this subject we have illustrations from Mr. Dodd, who tells us that six brothers and sisters in one family having been vaccinated when children, had the small-pox a few years afterwards. In another instance, two sisters, vaccinated in infancy, were subsequently inoculated, and had small-pox slightly; they both caught the small-pox again in 1837, and one of them had it very severely. Their father caught small-pox; their mother too, who was inoculated when young, had it again in the same year; their maternal grandfather, beholding from a window at night, the funeral of a friend who had died of small-pox, sickened of that disease and died. These are a few of the affinities and concordances between human small-pox and cow small-pox; and we doubt not that every subsequent observation will establish the analogies. In confirmation we farther remark, that the great object of inoculation with human small-pox was to produce an affection as much like that of cow small-pox as possible, and by great care in selecting the virus to be employed, this was sometimes accomplished in a very remarkable degree. On the other hand, it is known that the disease, when casually caught from the horse or cow, is often a severe one—as severe, it was said by an experienced observer, as for the most part was inoculated small-pox. We ourselves have seen it,

when caught from the horse, exhibiting great intensity, the hands and arms being covered with the eruption.

We will conclude this subject by an extract from one of Dr. Jenner's unpublished letters. "The greatest of all impediments to correct vaccination is that which arises from an herpetic state of the skin; indeed, compared with this, all the rest are as dust in the balance; and when the rules which I have again and again laid down respecting this point, and for so long a period, are attended to, then, and not till then, will the confidence of the public be fully established as to its preventive power."

ON VACCINE MATTER.*

The Academy of Sciences of Paris has proposed the following question as the subject for a prize of 10,000 francs, to be accorded in 1842.

Is the preservative power of vaccination absolute, or is it only temporary?

In the latter case, determine by precise experiments and authentic facts, the time during which vaccination defends from small-pox.

Has recent cow-pox a more certain, or more permanent, preservative power than the vaccine matter which has been already employed in a greater or smaller number of successive vaccinations?

Supposing that the preservative power of vaccine grows weaker by time, should it be renewed, and by what means?

Has the greater or less intensity of the local phenomena of vaccination any relation to its preservative power?

Is it necessary to vaccinate the same person several times, and, if it be, after how many years should the vaccination be repeated?

The memoirs for this prize must be sent to the Secretary of the Academy before the 1st of April, 1842.

In a memoir† recently published by Professor Otto, of Copenhagen, he concludes, 1. That the vaccine virus has lost none of its original power. 2. That a child cannot be vaccinated too soon after birth. 3. That the protective influence of the virus gradually diminishes with time; in some, perhaps the greater number, after a certain lapse of years. 4. The nature of the cicatrix does not enable us to determine how far the disease will be modified. 5. Small-pox, occurring in the vaccinated, is always modified, and the more so, the younger the person. 6. Regular variola, in the vaccinated, appeared only in persons who had passed the age of fourteen. 7. Out of ten vaccinated persons who died, none had passed the age of twenty-three. 8. Not a single case of small-pox had, as yet, occurred in the re-vaccinated.

* *Comptes Rendus*, Dec. 30th.

† *L'Experience*, No. 128, 1839.

ON POISONING BY CONCENTRATED ACIDS, AND ON THE FIRST AID TO BE ADMINISTERED.‡

BY A. CHEVALIER.

Hitherto the greater number of practitioners have agreed in establishing, that the first assistance to be given against acids consisted in the administration of alkalies, and particularly of decarbonated magnesia, numerous facts seem to show the good effects of this medication.

Now it is settled that this mode of procedure is not rational, and that another method must be followed, It is supposed that all the ingested acid is absorbed, and it is decided that acids are cold or hyposthenisant poisons. 1st, The poisoned subject must be made to vomit by irritating the œsophagus with a feather; 2d, that he must, without delay, be made to drink pure wine, mixed with warm broth; 3d, that magnesia may be added to the drink, if it be presumed that unabsorbed acid remain in the stomach.

We think that the method which ought to be adopted is that which facts have shown to be attended with success; then, if those authors who have published facts on poisoning by concentrated alkalies be consulted, it is evident that in most cases the alkalies, when they have been employed in time, have saved the patients. If it is enquired what are the facts which may allow the results of the newly recommended method to be studied, but few will be found, at least to our knowledge. What ought we to conclude from these investigations?—that the most certain mode must be employed, and experiments must not be made on man to establish the value of such and such a method.

We think that experiments made on animals might elucidate the question; we protest that they be tried by persons whose object it is to establish that the anti-hyposthenisant method ought to supersede the summary one of saturation.

To put our readers in a situation to study facts, we will here point out, 1st, the cases of poisoning by concentrated acids come to our knowledge, and in which the method of saturation has been successful; 2d, cases in which autopsy has shown that acids are not absorbed, as has been pretended.

‡ *Journal de Chimie Médicale*, Jan. 1840.

CASES OF POISONING TREATED SUCCESSFULLY BY ALKALIES OR BY SUBSTANCES SUSCEPTIBLE OF SATURATING THE ACIDS.

The first case we will quote was observed in 1825 by M. Correa de Serra. Madame V. J——, sempstress, having swallowed by mistake two ounces of concentrated sulphuric acid, was submitted to a treatment by magnesia; she was saved, but she remained a long time affected by the disastrous consequences of cauterization by the acid.—(*Journal de Chimie Medicale*, t. ii. p. 210.)

The second was remarked by M. Gabriel Pelletan, in 1835. Madame N——, aged 27, wished to poison herself with liquid blue —*a solution of indigo in concentrated sulphuric acid*;—this blue had been diluted with water. Calcined magnesia being administered gave rise to such satisfactory results that the patient was promptly relieved and cured. (*Journal de Chimie Medicale*, tome i. 2d Series, p. 11.

The third was communicated to us by M. Lalande, apothecary at Falaise. M. Fert, dyer, having swallowed by mistake a glass of concentrated sulphuric acid, magnesia was administered; it caused the first symptoms to cease, and the patient was saved. (*Journal de Chimie Médicale*, t. iii. 2nd series, page 439.)

The fourth was observed in 1837 by M. Emery. A young girl was brought to the hospital Saint Louis, Napoleon ward. She was treated by magnesia, and this treatment which gave rise to some purgations, caused the symptoms to cease: the patient left the hospital cured.

The fifth was quite recent. A servant of M. M——— having taken sulphuric acid for wine, drank a certain quantity of it: magnesia was administered to him immediately, and he was, after a little time, in a condition to continue his occupation: however, he still lives only on milk.

POISONING BY NITRIC ACID.

I have had an opportunity of observing two cases of poisoning by nitric acid.

The first in 1820 or 1821, in the Hospital de la Pitié. A young working jeweller was brought to this hospital: he had taken, in consequence of being crossed in love, nearly half a glass of aqua fortis. As soon as he arrived, a dose of calcined magnesia dissolved in water was administered to him. This medication calmed the symptoms, and ten days after the patient left the hospital. This workman retained for a long time a remarkable thinness.

The second in 1828 or 1829. We were informed that a young girl had just, on account of trouble, poisoned herself with nitric acid. We repaired immediately to the patient. There was administered to her almost by force, at least four ounces of calcined magnesia dissolved in water. The symptoms were calmed, and the patient was very promptly re-established; she lives still, for it is not long since we met her.

These facts show, in our opinion, that carbonated magnesia is an antidote for acids, and that it ought to be employed as an antidote in cases of poisoning by the acids.

ARE THE ACIDS ABSORBED IN CASES OF POISONING BY ACIDS?

In searching among the works which we have been enabled to do concerning poisoning by acids, we are in a position to prove that when poisoning by an acid takes place, the acid is not absorbed, and remains upon the tissues; indeed, 1st, the examination of the stomach and intestines from the body of Cuiquin, who died at Montmartre in consequence of the ingestion of sulphuric acid, October 6th, 1835, has demonstrated that these organs contained a great quantity of free sulphuric acid, which had not been absorbed. (*Judicial Report of the 27th Oct.* 1835.)

2nd. The examination of the stomach and intestines of M. Doré, who died by poisoning with sulphuric acid, demonstrated that the stomach contained a great quantity of free sulphuric acid which had not been absorbed; and that part of the intestine contained the same acid free. (*Judicial Report of the 15th Feb.* 1836.)

3rd. The examination of the stomach and intestines of the body of the girl Adolphine Cauvin, who died on account of having swallowed sulphuric acid, has shown that these organs contained that acid free. (*Judicial Report of the 7th January*, 1838.)

These facts show, in our opinion, that in cases of poisoning by the concentrated acids, the acid is not absorbed, and that there is a necessity, in cases of poisoning by acids, to proceed to the annihilation of these acids by aid of an absorbant substance.

We shall be told, it is true, that in this case it does not act *in a capsule, in a retort, in an alembic*, (it is the common observation employed by all those who oppose the application of chemistry to medicine), to which we reply:—Poisonings have taken place by quantities of acids which should have caused death, the antidote has been administered, the patient has been saved. What more ought to be expected?

We will here terminate what we have to say on this subject; we shall expect, in order to be convinced that alkalies or alkaline carbonates should not be administered in cases of poisoning by concentrated acids, that there be proved to us by very positive facts, 1st, that the patient can be saved by other methods; 2ndly, that these methods

are preferable; 3dly, that acids ingested in the stomach are entirely absorbed, which does not take place if we rely on the examination of the bodies of persons who have died in consequence of poisoning by acids.

THERAPEUTICAL ACTION OF PRUSSIC ACID.*

The following is a summary of M. Becquerel's researches:—

In diseases of the heart the use of prussic acid is more injurious than useful, as it sometimes increases the distressing symptoms.

The anhydrous acid, prepared after the manner of gea-pessina, is the only one which should be employed medicinally: it keeps for a long time without being altered, and its action is uniform.

It should be given in a mixture of four ounces of water without sugar, and by spoonfuls. Uniformity in the strength of the doses is thus obtained.

When given in a dose of from 8 to 12 drops this acid acts locally, and with intermissions; but when carried to 16 or 20 drops, and continued for a certain time, its action is general and not intermittent: it is essentially hyposthenic.

In larger doses than those just mentioned, prussic acid is apt to occasion certain accidents, the chief symptoms of which consist in a violent excitement of the nervous and circulating systems.

It has no influence on the progress or symptoms of any disease; but in some nervous affections it may change the progress, intensity, and nature of the symptoms, without bringing about a complete cure.

POISONING BY METALLIC ARSENIC; CURE BY THE HYDRATE OF PEROXIDE OF IRON.†

BY M. BATILLIET.

The cases of cure of poisoning by arsenical substances, by means of the hydrate of peroxide of iron, not being very numerous, it is useful to notice those which are presented, in order to dissipate the doubt which might still exist. We, therefore, hasten to report the following fact to the society:—

The 4th of last October, MM. S....., father and son, experienced violent vomitings at their supper; it was thought that the cause was found, after perceiving that the bottle, having held the wine which they had consumed, contained a foreign body.

This bottle was fortunately brought to us from the country where these gentlemen resided. Before every other investigation, it occurred to us to heat a fragment of this solid body by the blow pipe. This attempt was sufficient for us to recognise immediately that it was arsenic in the metallic state.

We hastened to communicate to the physician, that hydrate of peroxide of iron dried in the open air had been lately tried. A spoonful was administered in sugared water, but that was only effected three hours after the first symptoms of poisoning, on account of the distance. However, at the third dose with one of the persons, and, at the fourth, with the other, the vomitings ceased.

During this time, and with prudence, we hastened to prepare a new quantity of oxide, to be given in the humid state, as that has been most particularly recommended.

In so pressing a case, as we could not follow the ordinary course, to procure this preparation promptly, we thought another ought to be adopted, which we give, because apothecaries may find themselves in our situation.

Some iron filings were put into a large vessel with dilute nitric acid and heated, water was added to the solution, it was decanted to separate the excess of filings, ammonia was poured into it, in slight excess; afterwards, the whole was poured into the vessel; it was again placed on the fire, with the view of driving off part of the excess of alkali and of giving to the precipitate a cohesion which rendered it more easy to wash; it was drawn off clear by aid of a siphon, and finished by washing with warm water: the first having been slightly acidulated by vinegar; it was dried on a cloth.

By operating thus, we were able to dispatch, two hours after, about two quarts of a pap of peroxide of iron, of a good consistence. The physician administered a large dose, although the vomiting had ceased, and towards four o'clock in the morning the patients slept until seven; the remainder of the day was passed without symptoms, and the next day they were able to walk in the country.

After the first symptoms, a member of the family and two servants tasted the wine which remained in the bottle: all three were seized with vomitings; but without subsequent depression, probably on account of the small dose each had taken.

Metallic arsenic is evidently dissolved in passing to the state of arsenious acid; which takes place very promptly by virtue of the rapid oxidability of this body, especially in the presence of so complex and alterable a liquid as wine.

Wishing to ascertain as near as possible the quantity of arsenic which might, in

* *Gaz. Med. de Paris*, Jan. 13, 1840; and *The Lancet*.

† *Journal de Chimie Médicale*, Jan., 1840.

contact with wine, pass to the state of arsenious acid, the bottle was filled in which there yet remained 40 grammes of arsenic. After twenty four hours' maceration, it was filtered, the 808 grammes of the wine which it contained, and which had not contracted any unpleasant taste, was evaporated.

The residue was burnt with a mixture of nitrate of potassa, subcarbonate and muriate of soda; after deflagration, the salt was dissolved in distilled water and supersaturated by hydrochloric acid, next, submitted to the action of a current of sulphuretted hydrogen; the next day 1 gramme 329 milligrammes of orange sulphuret of arsenic was gathered, which furnished 1 gramme 265 milligrammes of arsenic, or about 1 gramme 3 decigrammes of arsenious acid.

It is to be supposed that the dose of poison swallowed by MM. S——— was much more considerable; for, independent of the pulverulent portion carried along with the wine at the moment of pouring it out, its continuance in this bottle had been eight months.

Be it as it may, the dose was sufficient to cause death; thus, the action of peroxide of iron has been irrevocably efficacious.

From the above, it would appear that the hydrate of peroxide of iron dried in the air, produces as good effects as that which is still humid.

At all events, both ought always to be found in apothecaries' shops; but, before enclosing the latter in flasks, a portion of it should be dried, and the quantity of dry peroxide which corresponds to the moist should be written on the label of the vessel.

Without this measure, it is evident that it would never be known whether the dose administered to the patient were sufficient.

Too frequently, accidents of this kind are occasioned by the metallic arsenic, which the grocers sell indiscriminately to all who come, under the name of fly's-bane, black lead, and even cobalt.

How does it occur that the law, so precise in its applications, can strike an apothecary so severely, while the irresponsibility of the grocer and the druggist is tolerated in such a matter? The conclusion is natural, it seems that those who distribute justice, do not make an equal division.

ON FERRUGINOUS PREPARATIONS.*

BY M. BERAL.

M. Beral, one of the most distinguished apothecaries in Paris, has just submitted to the view of the Academy his numerous and rich collection of salts of iron; it is impossible to find preparations of greater beauty, or of more complete purity than those presented by this skilful chemist.

In the letter addressed to the president, M. Beral expresses himself thus, saying that two of the preparations are especially worthy of the attention of the Academy.

"The first of these preparations is a citrate of iron, which I made known eight years ago, but in the preparation of which I have, since that time made signal improvements.

"A summary exposition of the qualities which belong to this ferruginous salt, will be sufficient to predict the advantages which medicine has reason to expect from its use.

"This citrate contains half its weight of peroxide of iron, atmospheric air has no influence over it, its solubility is perfect, and its preservation easy and unlimited. Another quality of this citrate, and which is not less important than the preceding, is that it has not the styptic and atramentary taste which characterizes other ferruginous salts, a taste which much prejudices, as we know, the employment of these medicaments.

"This citrate of iron is obtained under the form of transparent bracteæ of a beautiful garnet colour, by means of a process which I shall have the honour of communicating to the Academy through the medium of the minister of commerce.

"The qualities which practitioners seek in ferruginous bodies are found combined, as we have just seen, in this citrate. It will not, therefore, be surprising to hear, on one part, that employed as a therapeutic agent its action has always been prompt and certain, and that, on the other side, considered with respect to the agreeableness of its use, there does not exist any preparation of iron which can be compared to it.

"The second product, or tartrate of potassa and iron, is a substance very anciently known, but which left much to be desired with respect to its composition.

"This salt, which I present to the Academy under the form of transparent scales, possesses the character of being entirely soluble, of not undergoing any alteration when exposed to atmospheric air, and of having a strong atramentary taste. It may be used externally, and its solution may be substituted with advantage for other medicaments, whose composition is equivocal and action uncertain.

"Next come, under the form of syrup, of saccharure, of lozenges and pills, the pharmaceutical compounds which have the citrate of iron for their basis.

"Moreover will be remarked:—

"1st. A native peroxide of iron (hæmatite), which of all the native and factitious oxides of iron is the purest, and which, on

* *Academy of Medicine*, Sitting of the 24th December, 1839.

account of this circumstance, I employ in the preparation of the citrate and other salts of iron:

"2nd. Hydrate of peroxide of iron in the state in which it is fit to be employed in cases of poisoning by arsenic:

"3rd. The same hydrate dried, and nevertheless containing a third of its weight of water, which facilitates its absorption:

"4th. Perchloride of iron crystallized by a process which I have already made known; in this condition the chloride is almost neutral and most easy to proportion:

"5th. Hydrochlorate of ammonia and iron in a state of peroxidation, whose composition is invariable:

"6th. Liquid acetate of iron:

"7th. Pure and crystallized sulphate of iron:

"8th. To conclude, a ferruginous wine of quinquina already known, but of which I have improved the method of preparation, and to which may now be associated citrate of iron in all proportions, without fear of altering its properties. Formed by the union of elements which many people supposed incompatible, the ferruginous wine of quinquina constitutes a medicament the want of which was constantly felt, and which in the hands of physicians, will receive numerous and useful applications.

The Academy adjourned the nomination of a commission to make a report, until it has received from the minister of commerce the communication of the processes employed by M. Beral.*

QUININE AND ITS ADULTERATION.

To the Editor of The Chemist.

SIR,—Convinced that anything which may tend to draw attention, where doubt may exist, as to the purity of a drug, will be received by you with indulgence, we have taken the liberty to offer you these few remarks.

The substance that we wish to bring before you is the Quininæ Disulphas, a salt which has for some time past gained a high and just celebrity, but is now we are afraid falling into disrepute. Our attention to this subject was first attracted, by the complaints of some physicians, regarding the slow and uncertain action of quina. This was most singular, as we have always used Pelletier's or Howard's preparation. But when some of those gentlemen employed the Pulvis Cinchonæ lancifoliæ, with success, in those very cases, in which they had found Disulphate of Quinine to be comparatively inert, we fancied that, even the names of Pelletier and Levaillant were not a sufficient guarantee for its purity. Now, the mode of preparing the Quinine is so simple, that if it were *carefully* followed, a powerful medicine ought to be produced.

That the true Pulvis Cinchonæ is a good medicine cannot be doubted; but the quantity of extraneous matter, which must be swallowed by the patient, when this substance is employed, is so great that few stomachs can bear it. We may, therefore, mention here a very elegant and at the same time simple method of giving the bark. It consists in making the powder into a paste with water, which of course decreases its bulk: each dose of this Cinchona paste is then to be placed on a piece of wafer paper, previously moistened upon that surface on which the paste is laid, rolled up, and swallowed. In this way the nauseous taste is got rid of, and the sickening doses of so much woody fibre entirely obviated.

We have examined the French and English Quinine, and find, that the former contains 15 per cent. of Sulphate of Lime, mixed with other earthy matter. Howard's preparation appears to us to be the most pure, even when tested according to M. Delondre's method. There is a third kind of Quinine in the London market, called *German*, and said to be procured from the bark of the Æsculus Hippocastanum. This we have not seen; but from its low price would much fear its adulteration. Some have supposed that unctuous or cerous substances have been used to adulterate Quinine, but we have failed in discovering even traces of Stearine, Margarine, &c. Sugar also appears to be absent from that which we have examined. Might we enquire, whether the principle obtained from the bark of the Saline Helise, discovered by M. Leroux, called Salinisæ, and which bears a correct resemblance to this salt in appearance, does not become a substance by which the Quinine may be adulterated. The Cinchona Bark, being so dear at present, offers great inducement for extensive substitution, where this can be done with safety, and we are well aware how frequently a spurious drug is brought before us. It would appear to us that the quantity of earthy matter, found in the salt, must arise from carelessness in the preparation; for if lime or potass be used, for the purpose of reducing the super-sulphate to the disulphate of Quinine, the insoluble earthy sulphate thus formed, although only mechanically mixed with the Quina, unless cautiously got rid of, and *pure* alcohol used, are very likely to prove a source of adulteration.

M. and F.

Edinburgh.

* *Journal des Connaissances Médicales*, January, 1840.

ADULTERATION OF SULPHATE OF QUININE.*

In 1831, volume 17, page 520, of this Repertory, upon the faith of a German journal, M. Vallet noticed the adulteration of sulphate of quinine by mannite, and pointed out for the separation of these two substances the use of absolute alcohol. In one of the last numbers of the *Journal des Connaissances Médicales*, M. Dubail has just mentioned an example of this fraud, which shows with what audacity it is carried on at the present time.

A druggist of Paris having requested him to analyse a sample of sulphate of quinine, he observed that this sulphate, perfectly resembling by its lightness and silky aspect the ordinary sulphate of quinine, presented, however, but a slightly bitter taste and mixed with a sweet after-taste. Treated by distilled water, it was almost entirely dissolved, while alcohol at 40° took up only a sixth of its weight. M. Dubail admitted, after these experiments and some others to which he submitted this mixture, that it was formed of five parts of mannite and one part only of sulphate of quinine.

We can add to this fact that M. Pelletier has recently recognized in the sulphate of quinine, sold under his own seal, a great quantity of plaster.

Our brethren will no doubt conclude with us from these observations, that even the most respectable seal is no guarantee for the purity of sulphate of quinine, since it may be usurped by fraud, and that direct verification is indispensable for this as for all other products which apothecaries send out in commerce.

CHLORIDE OF SODIUM IN SCROFULA.†

M. A. Latour speaks highly of the utility of this remedy in scrofula or pulmonary consumption. The following case is illustrative of its effects:—

A girl, 13 years of age, of lymphatic temperament, suffered, for more than a year, under scrofulous symptoms; the sub-maxillary ganglia were greatly enlarged, and the upper lip was the seat of an extensive scrofulous ulceration, for which a variety of remedies had been tried during eleven months without benefit.

On the 9th of April a drachm of sea-salt was given in soup, and ordered to be continued daily. The sore was washed with salt-water, and the diet was confined entirely to animal food. The re-action produced by the salt was so great that the dose was diminished by one half, and then continued at that dose. The child took frequent exercise in the open air. Towards the middle of May the ulcer was healed, and in fifty days a complete cure was obtained. M. Latour recommends that the salt should be given in flour, made up in the form of a little French roll.

Thus a drachm of salt, dissolved in a small quantity of water, may be mixed with four ounces of flour. Children will readily eat one or two of these rolls in the day.

SYRUP OF IODIDE OF IRON.‡

℞ Pure iodine	- - -	20 grammes.
Iron filings	- - -	10 grammes.
Distilled water	- -	116 grammes.

The mixture is left to digest, the residue is filtered and washed with a little distilled water. The liquors are combined, and 58 grammes of sugar are added; it is evaporated until there remain but 116 grammes of syrup, which may form, with the powder of marshmallow, a good pilular mass, and with water a solution which is preserved limpid. Four parts of this syrup contain one part of iodide of iron. This salt, thus prepared, may be kept for more than three months, without being decomposed, even in contact with the air. Hengel has observed that the syrup is at first brown, but that it does not delay to take a lighter colour, unless it deposits oxide of iron. (*Bachner's Repertory of Pharmacy*, 1839.)

ELATERINE.§

At a meeting of the Westminster Medical Society, Saturday, February 1, 1840, Dr. Golding Bird exhibited a specimen of elaterine, the active principle of elaterium. He remarked on the great variety of opinions and accounts which existed with reference to the effects of elaterium, and attributed this diversity to the mode in which the so-called extract was prepared; its activity, on some occasions, being very much less than on others. For some time past it has been stated, in German and French works on pharmacy, that the active principle of elaterium had been discovered, but no mode for its preparation had been detailed. Two years since he had been favoured with a specimen of elaterine by the Liverpool Apothecaries' Company, who had forwarded it to him in order that he might give it a trial. It was found that the quan-

* *Journal de Pharmacie*, Jan. 1840.

† *L'Esperience*, Jan. 9, 1840; and *The Lancet*.

‡ *Journal de Pharmacie*, January, 1840.

§ From *The Lancet*.

tity of the alkaloid contained in the various extracts of elaterium differed to a very considerable extent; thus, one specimen yielded 58 per cent of the active principle, while others, apparently as good, yielded only 8 and 10 per cent. He had used the new preparation in several cases in which elaterium would be of service; he had found it produce no vomiting or griping, which was, probably, owing to the absence of the green matter of elaterium. The mode in which he had obtained the preparation before the Society, had been the following:—He boiled a quantity of the green elaterium in spirit, and formed a green tincture; into this he poured some water, in which an alkali had been dissolved; this took up the green matter, and the elaterine was deposited. Elaterine was soluble in warm spirits of wine, or spirits of sweet nitre. The dose of the elaterine was a sixteenth of a grain.*

ON THE MANNITE OF THE AGUNCATE TREE.†

BY M. MELSENS.

In an article inserted in the *Journal de Chimie Médicale*, vol. vii. p. 467, M. Avequin, apothecary in the island of Saint Domingo, announced that the seed of the aguncate, the fruit of the aguncate tree, *laurus persea*, contained, besides albumen, oil, &c., a considerable quantity of mannite: twelve pounds of the seed yielded 4 ounces 48 grains. The elementary analysis of this substance (which exhibited all the physical characters of mannite) not having been made, it remained to be proved that it indeed possessed an elementary composition identical with that of the mannite extracted from manna.

With this view, M. Dumas had the kindness to procure me some seed of the aguncate and some mannite from M. Aveqnin himself. These are the results of an analysis made in his laboratory.

I. 0 gr. 400 of matter gave 0·279 water and 0·577 carbonic acid.

II. 0 gr. 300 of matter gave 0·206 water and 0·431 carbonic acid.

In hundredths:—

	I.	II.
Carbon	39·9	39·8
Hydrogen	7·7	7·6
Oxygen	52·4	52·6
	100·0	100·0

These numbers agree with those of M. Liebig, who found:—carbon 40·0, hydrogen 7·6, oxygen 52·4.

To avoid all difficulty, I sought to extract the mannite from the aguncate seed which I had at my disposal.

In treating 60 grammes of aguncate seed, reduced to a coarse powder, with a third of a quart of boiling alcohol, the filtered liquor, which is of a brownish colour, allows to be deposited, by cooling, mannite crystallized in needles, soiled by oil and brown colouring matter. These being treated a second time by alcohol and animal charcoal, yield mannite of a perfect whiteness. The 60 gr. produced about 1 gr. of matter; the supernatant liquors were thrown away, it being required to prove the presence of mannite and not its quantity. The results of its analysis have always been materially the same.

0 gr. 300 of matter gave 0·309 water and 0·439 carbonic acid.

Or in hundredths:—

Carbon	39·6
Hydrogen	7·7
Oxygen	52·7
	100·0

Thus the mannite of the aguncate seed is identical with that of manna.

PREPARATION OF DECOCT. ALOES COMPOSITA, AND SPIRITUS ÆTHERIS NITRICI.

To the Editor of The Chemist.

SIR,—I would beg to call your attention to the preparation of Decoct. Aloes C. as ordered in the *Pharmacopœia*. So much is lost in allowing it to deposit, that I have taken the liberty of using the *Ext. Aloes. pur.* and *Ext. of Licorice* made by Smith, Fell Street, Wood Street, which is perfectly soluble and a beautiful article; so by using the myrrh bruised, instead of the fine powder, I get very little deposit and an article very far superior to that in general use.

I wish you could call the attention of the Manufacturing Chemist to the mode of preparing the Sp. Æther. Nitrici; for I have found that, in most laboratories, the Spirit and Acid are mixed suddenly together, put into the retort and a strong fire employed to draw it over as quickly as possible. There is consequently driven over a considerable portion of acid, rendering it an article I am sure quite different from what is intended in the *Pharmacopœia*. I have always prepared mine by means of a water-bath, *i. e.* by placing the retort in a water-bath well heated instead of the sand-bath, and then attaching an earthenware worm in a tub, to the bot-

* We are informed by Dr. Bird, that the elaterine exhibited was made by Balmer, an operative chemist of Islington, where it may be procured.—REP. LANCET.

† From the *Annales de Chimie et Physique.*

tom of which cold water is constantly flowing.

W. BARTLETT, *Druggist*, &c.
Chelsea.

ON THE STRENGTH OF HYDROCYANIC ACID.

To the Editor of The Chemist.

SIR,—Permit me to call the attention of your readers, especially such as are Chemists and Druggists, to the strength of the Hydrocyanic Acid of the *London Pharmacopœia*, 1836. Previously to the publication of this edition, hydrocyanic acid was in common use among medical men, though no formula for its preparation had been given, nor had it even been mentioned in the *London Pharmacopœia*. The acid of Scheele's strength has been almost universally used till now: but the acid made according to the *Pharmacopœia* is only *about one-third* of that strength, and as no notice is taken of this difference either in the *Pharmacopœia* itself, or in Phillips's translation, it is probable, (indeed, it *has* been frequently the case,) that they have been supposed to be identical, from which the most fatal results might follow, as the dose of the acid prepared according to the *Pharmacopœia* is three or four times as large as that prepared by Scheele's process. It was the largeness of the dose as indicated in the posological table at the end of Phillips's translation which first attracted my attention: and on inquiry, I have ascertained that the acid there given is only one-third the strength of Scheele's. Hoping that the notice will draw the attention of others to this important subject, I am, &c.

A CHEMIST AND DRUGGIST.

SALT AT THE SOURCE OF TOMABELA IN SOUTH AMERICA.*

BY M. DE PARAVEY.

M. de P. called the attention of the Academy to a salt which crystallizes upon the borders of the source of Tomabela, province of Chimbo, capital of Huaranda, on the road from Guyaquil to Quito, in South America. He remarked that, according to certain travellers, this salt is employed as a specific against goîtres: with this view their food is seasoned with it. This natural production is of a beautiful white, and pulverizes easily. It would be easy to procure samples of this salt, and to see whether iodine enters into its composition.

M. Bousingault, on the subject of this letter, said, that having had occasion, during his travels in South America, to make an analysis of the waters of this source, he proved the presence of iodine in it.

* *L'Institut*, No. 316, Jan. 16, 1840.

TO CORRESPONDENTS.

NOTA BENE.—*All Communications must be addressed, "To the Editor of The Chemist, care of Mr. Hastings, Publisher, 13, Carey-street, Lincoln's Inn Fields, London."*

With the opinions expressed in the letter of MR. PHILLIPS, of Luton, we in a great measure coincide. "The true chemist," he observes, "the philosophic enquirer into nature, asks no exclusive privileges; he that is now content to devote time, money and often health, to the pursuit of knowledge, wishes not that the law should draw a fence around him; he does it now for the honour due to the votaries of science, for the bright pleasures which the possession of her truths afford him: so should his distinction be an honorary one. Let, however, a school for the study of chemistry and pharmacy, theoretical and practical, as well as those branches of natural philosophy, mineralogy, botany, &c., which are most closely connected with these be formed; let the establishment be placed under proper government, and teachers qualified for the office be appointed; and then let those who choose enter themselves as pupils, paying such charges as may be deemed sufficient—and the charge should be as moderate as possible. At stated times examinations should be held; and such as were found competent would be entitled to receive a diploma of their proficiency. As for the rest, leave the world to judge between the chemist having a thorough knowledge of his profession and the retailer of drugs ignorant of the nature, composition, and powers of the articles which he vends."

The REPORT OF THE PRICE OF DRUGS has been found inexpedient, as taking the place of more valuable matter, &c. &c.

Mr. BARTLETT'S proffered communication will be very acceptable.

Mr. TUPP is sincerely thanked for his advice, which will receive serious consideration. The perusal of the document alluded to would be a favour.

A WELL-WISHER and Subscriber, we trust, now receives "The Chemist" as early as other Periodicals. His valuable suggestion will in due time be acted upon.

Important COMMUNICATIONS are of course acceptable; but our space does not admit of DISCUSSIONS.

STEWART AND MURRAY, PRINTERS, OLD BAILEY.

THE CHEMIST.

I. CHEMISTRY.

ON THE REDUCTION OF GOLD AND SILVER, TO THE METALLIC STATE FROM THEIR SOLUTIONS IN ACIDS.

BY CHARLES WATT.

CHEMISTRY is indebted to the genius and industry of the late Mrs. Fulhame,* (distinguished alike for her talents and her misfortunes,) for a few of the most beautiful experiments and accurate deductions which are to be found in that science.

With the view of improving her broken fortunes, she made a series of experiments in order to enable her to cover ribbons and silks with an external coat of gold and silver. The method she pursued was the following.

She first made a solution of gold by dissolving that metal, divided into fine grains, in a compound of one-third nitric and two-thirds muriatic acid, in a glass vessel;† she applied a gentle heat thereto until all the gold disappeared, and she afterwards continued the heat to evaporate all the uncombined acid, when the nitro-muriate of gold formed itself into a beautiful mass of yellow crystals, which she redissolved in five or six times their weight of distilled water; and with this solution she prosecuted her experiments.

She dipped pieces of ribbon or silk into the solution; and, while wet, she subjected them to hydrogen gas, phosphuretted hydrogen gas, and also to the fumes of phosphorus and of sulphur, when she found that the gold was almost immediately revived, and gave the surface of the silk the appearance of a beautiful web of burnished gold, which in the sun's rays glittered too much to be viewed without pain. She also exposed them to the action of light and other deoxidising bodies, and with the same results, differing only in their degrees of perfection, according to the power of the agent employed.

The next step was to dissolve the nitro-muriate of gold in alcohol and in sulphuric ether,‡ as it is said these bodies dissolve the oxides only of these metals, leaving the acid free.

Having dipped, as before, the ribbon or silk into these solutions, she observed, that when she removed them, and while they were wet with the gold in solution, having exposed them to the agents already named, they had no effect in restoring the gold to its metallic state, — she found, in fact, that water, either in the solution of gold, or in the form of steam or vapour, was absolutely necessary for the reduction of the nitro-muriate.

She next tried a solution of the nitrate of silver in precisely the same manner, and with exactly the same results; no reduction taking place, if water, in some form or other, were absent.

Were it necessary that these salts should be in a liquid state, according to the chemical axiom, "corpora non agunt nisi sint soluta," when exposed to deoxidising agents,

* This lady, the widow of a physician, after struggling with great privations and disappointments, died in abject poverty in a mean apartment in the vicinity of Soho Square.

† The greatest care should be taken to get the nitro-muriate of gold as free from uncombined acid as possible. It is stated in chemical works that the chromic acid, combined with muriatic acid, will dissolve gold. This, however, it can only do by producing chlorine and chloric acid; and as we have no account of any practical application of this solution, we cannot see how it could be advantageous. Certain it is, however, that if that powerful and highly corrosive agent, nitric acid, could be avoided, it would be very desirable.

‡ These solvents were employed, I suppose, on account of the solution in water destroying the texture of the silk, and causing it to tear with very little handling.

the reduction ought to have taken place, which was not the case.

I proved, indeed, that when exposed even to the powerful agency of the direct rays of the sun, no effect was manifest, where aqueous matter was deficient. I put some crystals of nitro-muriate of gold and nitrate of silver, quite dry, on a clean piece of glass, and then placed it under the exhausted receiver of an air-pump; and, after being kept in the sun's rays for several hours, scarcely any effect took place, and what did occur was clearly to be traced to some water in the receiver.

From such facts as I have related, Mrs. Fulhame drew the conclusion, that in reducing these metallic solutions, water acts by suffering a decomposition; and indeed this seems the only conclusion that can be drawn.

Disappointed at the total failure of her expectations of making ribbons and silks of gold and silver, as for this purpose they could not be perfected, she published her little treatise as the only means of repaying a small part of the expense and labour she had bestowed upon the subject.

Considering it, however, to be one which might be made available for useful purposes, and give origin to new sources of industry and profit, I made many experiments, from which I obtained some interesting results, which may not be unworthy of the attention of our readers.

My solutions were made as already described; the acid being carefully evaporated in the first instance, to ensure there being no excess.

It may here be proper to remark, that in these experiments my object was not to cover silk or ribbon, but such substances as quills or pens; conceiving that there would thence result a twofold effect; first, the protection of the substance from becoming softened by ink; and secondly, the extreme beauty and elegance of its appearance.

The difficulty of applying water and hydrogen at the same time, compelled me to relinquish the former agent, and after resorting to every one known to reduce metallic solutions, I found none to have so powerful an effect as phosphuretted hydrogen gas.

Accordingly, after dipping the quills or pens for about ten minutes in this solution of gold, I exposed them to the action of this gas; but here another difficulty presented itself, and that was, that the gas acted so powerfully that some portions of the gold were reduced to the metallic state, while others were changed to all varieties of colour by combining with portions of the phosphuretted hydrogen.

Hence I was led to try that compound of phosphorus and hydrogen which contains less phosphorus, and which was first prepared, I believe, by Gingembre, by boiling in a retort or other vessel a strong solution of caustic potash with phosphorus.

Having prepared this solution, I exposed the quills or pens previously dipped in the solution of gold, and I then found that the metal soon became reduced, and with all its accustomed brilliancy. Still, however, the effect was slow, and the surface of gold was exceedingly thin and transparent, in consequence of all the gold not being revived.

I therefore made various experiments in order to produce a more perfect reduction of the metal. From the very powerful affinity which the sulphurous acid gas is known to have for oxygen, I made many trials of it, but found invariably, that instead of reducing the gold on the quills in the form of a fine metallic covering, it converted it into the state of a brown powder more like a precipitate, which was wiped off on the slightest touch: still, however, the gold was perfectly reduced.

Conceiving that the defect here was not of a chemical, but mechanical nature, and that it depended on a want, if I may so express it, of an adaptation of surface in the substance of the quills, I adopted the following process, which I at once found to remove all the difficulties I had encountered.

Having dipped the quills into the solution, and removed them, I let them remain for about twenty minutes in the air till they became perfectly dry; then I exposed them in glass vessels to the fumes of this gas,* until a fine scale of gold had been reduced over all the surface which had been dipped in the solution. When this was done, I removed the quills or pens into a vessel containing a strong solution in water of sulphurous acid gas, keeping them suspended so that they should not touch the solution, but only be subjected to its fumes. The effect now became striking and rapid, and in a very few minutes the covering of gold was so thick as to render the quills or pens perfectly opaque. Seeing my object nearly obtained, I took out the quills or pens, and rinsed them carefully in soft water to remove the sulphuric acid formed on the surface, and thus to prevent it from corroding their substance or injuring the solution of gold when they were again immersed in it.

I repeated the operations of dipping them into the solution of gold, and reviving it as many times as I thought proper, and indeed

* It may here be necessary to observe, that at the temperature of between 60° and 70° not only sufficient gas, but likewise aqueous vapour also, was produced, as Mrs. Fulhame had shewn to be absolutely required.

until I have often covered the pens with a coat of burnished gold of surprising thickness and beauty.

It is a very singular fact, and one which can be referred only to mechanical causes, that, excepting in the revival of the gold, after the first dipping, the exposure of them to the action of the phosphuretted hydrogen gas was never required for subsequent revivals.

The last part of the process was to rinse the pens in water, dry them, and then polish them with a little whitening and wash-leather, when their appearance was very highly beautiful.

Considering the quills or pens merely as means of holding the solution on their surfaces, I felt convinced that upon any other substances the same results would take place, and accordingly I found that, when put upon glass,* precisely the same train of effects ensued, and that the first revival was not effected unless it was first exposed to phosphuretted hydrogen gas.

Seeing the effects of these two agents, viz., phosphuretted hydrogen gas and sulphurous acid gas in reviving gold, I was induced to try them when the solution was put upon such surfaces as silk, and here I found a very striking result. If, for instance, I dipped a piece of ribbon in the solution, and, while wet, exposed it to the sulphurous acid fumes, the same light powder of gold already mentioned took place; but if, on the contrary, the silk was previously immersed for a single instant in the fumes of phosphuretted hydrogen, and then removed suddenly into those of sulphurous acid, the whole of the dipped portion was immediately converted into a thin sheet of gold of the highest polish and lustre.†

In the course of these experiments, I found that precisely the same effects took place if, after being dipped in the solution of gold, and before immersion into the sulphurous acid gas, the substances covered with the solution were exposed for a very short time to other deoxidising agents, as light, hydrogen, or the fumes of phosphorus.

Induced by the results I have described, to extend my experiments to other substances, I subjected furs and feathers to the same processes; but I very soon found that in those delicate substances, I could not employ sulphurous acid gas; first, because it so soon wetted the whole fabric, and clogged it together, and more especially because it so rapidly became converted into sulphuric acid, and destroyed the texture of those substances.

I therefore was compelled to rely totally upon the phosphuretted hydrogen gas; and, by this agent alone, and making two or three dippings in the solution and subsequent revivings, I have been enabled to cover the delicate fibres of the ostrich feather, and even a spider's web, with a beautiful film of gold.‡

Of the revival of Silver from its solution.—It is well known that the chief and common solvent of this metal is nitric acid, which dissolves about half its weight of the metal.

In making a solution for the purposes which have been described in speaking of gold, the same, and even greater caution is necessary to evaporate all this acid (as it is by far more destructive of animal substances than the solvent of gold); and, when all the acid is expelled, and the mass crystallized, I have found it advisable to continue the heat a few minutes longer, in order to ensure no risk of uncombined acid remaining.

It is now to be re-dissolved in about eight or ten times its weight of distilled water or even more;§ and it is then in a fit state for the experiments.

I found, first, that in covering animal substances with silver, it was essential to clean them well before dipping them into the solution, in consequence of a kind of scurf being sometimes attached to them, which, in the process of silvering, comes off, and with it, the coat of metal, giving the substances an uneven and irregular appearance.

When thus prepared, I have generally dipt them in the solution until they became of a light yellow colour, or for about ten minutes; and I have then taken them out and let them dry in the air.

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* It does not seem improbable that a golden surface might, by some change and modification of process, be made the subject of the Daguerréotype.

† This effect is produced partly by the thin scale of gold first formed by the action of the phosphuretted hydrogen gas; but the suddenness of effect is especially due to the sulphurous acid gas, which by holding more aqueous vapour than the other gas, acts under more favourable circumstances.

‡ I found, in gilding this delicate substance, that the solution of gold ought to be diluted with at least eight times its weight of water.—After many trials, I was convinced that the essential oil of lavender was the best solvent; as the feather was less injured in texture, and not so much clogged.

§ Distilled water is particularly necessary, as all water contains some portion of salts which render the solution turbid, and injures its chemical action.

As those I chiefly made the subjects of experiment, were quills and pens, I shall here describe the process and its results.

When I first subjected these substances to the process of reviving, I found that extreme difficulty opposed itself to my success. I tried the sub-phosphuretted hydrogen, which I prepared in the following manner.

I dissolved about half an ounce of pure potash in an ounce and a half of water, and I then put in about one drachm of phosphorus, and applied a gentle heat till the phosphorus fused. I then shook the bottle containing it so as to divide the phosphorus into small grains, and then put it in a cold place in order to allow the phosphorus to become solid. This being done, I subjected the quills or pens, previously dipped and dried, to the fumes given off by the phosphorus. The silver soon appeared, indeed; yet it never became of pure metallic lustre, but, after evincing a certain degree of reduction, it assumed various colours, from dark blue to brown, owing to the combination of a portion of phosphuretted hydrogen.

This occurred so regularly in every experiment, that I was obliged altogether to abandon its use as totally unadapted to the purpose.—Still less so is the sulphurous acid; as it combines with the nitrate, converting it into sulphate, and thus preventing the reduction of the metal.

Finding neither of these agents suitable for the purpose, and as the phosphuretted hydrogen seemed to act too powerfully, I resolved upon trying phosphorus alone; and in doing this, I adopted the following method, which proved completely successful.

I took about a drachm of phosphorus and put it into a bottle containing as much water as would cover it, and then held the bottle over a lighted candle, and gradually and carefully heated it till the phosphorus fused, when I shook it gently, in order to break the phosphorus into small pieces.* This being done, I set the bottle in a cool place to cause them to become solid.

The next part of the process I conducted thus:—Having dipped the quills or pens into the solution of nitrate of silver for ten minutes, as already described, and afterwards allowed them time to dry, I then carefully drained the water out of the bottle containing the pieces of phosphorus, until there remained sufficient water only to cover the divided phosphorus about half way, leaving the other half exposed to the air. I then suspended the dipped quills or pens in the fumes of phosphorus, copiously generated and accompanied with aqueous vapour, sufficient, as I concluded, for the purpose of the reduction of the silver.

Some time elapsed before a perfect specimen of reduced silver was obtained. Not feeling, however, any fear of ultimate success, I allowed them to remain in the fumes of phosphorus for two or more hours, when I found that the reduction became complete. The first indication of the perfect reduction of the silver which came under my observation, was just at the points or nibs of the quills or pens, which were of the bright colour, and when polished, possessed all the lustre and brilliancy of that metal.

Upon further examination and observation of the changes from time to time, going on in the reduction of this metal from its solution, when the quills were suspended in the fumes of phosphorus, I found that the dark blue colour which was first produced, and which was caused by the metal being in a state of oxide, gradually became less and less; first, at all the points and angles of the quills, and progressively further and further on towards the centre, till, at length, it wholly disappeared, and the silver, in all its pure delicate whiteness, was perfectly reduced.

These quills were rinsed in water, and again dipped in the solution of silver, and subjected to a second reduction with precisely the same results; and the respective processes were alternately repeated till a beautiful and substantial coat of silver was given to them.

The foregoing experiments were afterwards made on pieces of glass, and with results perfectly the same as when made with quills, or other animal substances.

It is quite clear, from the foregoing experiments, that water is indispensable to the reduction, in the humid way, of metals from their solutions; and that the great art in reducing them consists in the employment of such a deoxidizing agent as does not combine with and tarnish them.

In conclusion, with respect to the reduction of silver, I have found that the method I have here detailed is the only one which can lay any claim to certainty or perfection, and the only one which holds out any prospect of ever being brought to practical utility in the arts.

* If, in shaking the bottle, any of the phosphorus ignites, it is necessary to have a bottle of cold water at hand, and to pour some of the cold water into the phosphorus bottle to extinguish the ignition.

ON THE PRECIPITATION OF GOLD.*

BY M. A. MORIN.

Whenever gold is dissolved, with a view

* *Journal de Pharmacie*, February, 1840.

of making some preparation of that metal, or to refine the surface of jewels to give it its colour, a more or less considerable portion of it remains in the mother liquor. Various processes of extracting it have been recommended. They are founded on the property possessed by many substances of mineral or organic nature, of precipitating gold from its solutions in the metallic state.

The principal substances used with this view are sulphate of iron, very long since employed, and formic acid, or the formiates of potassa and soda, which the most esteemed scientific repertories have lately praised as an excellent means of reviving efficiently, and at small cost, the small quantities of gold retained in a liquid.

Although sulphate of iron is very cheap, compared with the formiates or formic acid, the value of the metal for the extraction of which these substances are employed is such, that one should not, perhaps, hesitate to use the most expensive, if it afforded the means of extracting the gold more perfectly. It might therefore be interesting in every laboratory, or every art having occasion to make solutions of gold, to know the comparative value of the two processes most generally recommended for its precipitation. I have endeavoured to resolve this question by making use, with this view, of the mother liquors which resulted from some preparations of this metal.

They were divided into equal parts, each weighing a kilogramme, and as each part contained rather more than two grammes of gold, they represented a solution of this metal at $\frac{1}{250}$.

Into one I poured concentrated formic acid until it acquired a decided acidity. Its colour became of a fine deep yellow. It did not precipitate gold, even when heated. Formiate of potassa, tried with a small quantity of this liquid diluted, did not manifest any reaction. It was only when it had been evaporated to half, that metallic bracteæ appeared on the surface.

The addition of a few drops of caustic potassa much increased the production of it, which determined me to add it as long as it caused any precipitate. The latter had the appearance of blackish flakes mixed with metallic bractem. It was deposited very promptly. The liquid was neutral and of a green colour. A few drops of caustic potassa did not cause any more precipitate, and a slight excess of formic acid produced no other effect than that of turning the liquid to a deep brown. A new concentration of the liquid did not cause any farther separation of metal. The precipitate, washed and dried, was black. Heated to redness, it took the lustre proper to gold. Its weight was about 1·535 gr.

The washing water and mother liquor reunited, were then mixed with a solution of sulphate of iron. It formed an abundant black precipitate by muriatic acid with heat. It became very clear light brown. By adding to it more sulphate of iron, metallic bracteæ were formed. I continued the addition of this salt until nothing more was precipitated. The deposit washed with warm water, then with acid, was dried, and turned red. It had a metallic lustre. Its weight was raised to 0·717 gr., nearly half of the preceding. This quantity of gold added to the preceding gave a total weight of 2·252 gr. This experiment might be sufficient to show the superiority of sulphate of iron over formic acid and formiate of potassa for precipitating gold from its solution. I tried, in the meanwhile, the direct action of sulphate of iron on the other part of the liquid, acidulating it at first with muriatic acid, and heating it. I added sulphate of iron as long as it occasioned any precipitate. Violet at first, it passed afterwards to a clear brown. I separated the precipitate from the supernatant liquid, washed it with water and muriatic acid, dried it, and made it turn red. It weighed 2·280 gr. a quantity nearly equal to that of the two other precipitates.

The mother waters and the water of washing being united, were treated by formiates of potassa, which did not occasion any precipitate, even by concentrating the liquid much by evaporation.

These experiments show:—

1st. That formic acid only precipitates a solution of gold when it is evaporated so as to contain at least $\frac{1}{125}$ of gold.

2nd. That formiate of potassa produces this effect much better than formic acid alone.

3rd. That the formiate of potassa separates from a concentrated solution of gold only about two-thirds of the quantity of gold contained in it.

4th. That sulphate of iron precipitates it completely from liquids which contain only $\frac{1}{250}$ of gold.

The precipitation of gold by sulphate of iron is therefore much more advantageous than that by the formiate of potassa. It is complete, easier, and much more economical. However, two precautions are necessary to render this operation successful: the employment of heat, and a notable addition of muriatic acid.

Heat gives the precipitate a state of cohesion which facilitates the separation. The acid accelerates the action of the sulphate of iron.

The operation is thus concluded in a few minutes.

ON THE PILE KNOWN BY THE NAME OF BECQUEREL'S PILE.*

EXTRACT OF A LETTER FROM M. F. C. HENRICI TO M. POGGENDORF.

In order that our readers acquainted with the question may readily comprehend the letter of M. Henrici, we will remind them that Becquerel's pile, reduced to its simplest pressure, is essentially composed of two small glass matrasses, one of which contains nitric acid, and the other a solution of caustic potassa. The acid and the alkali should both be very concentrated. The two matrasses communicate together by means of a bent tube filled with very fine argil, moistened with a solution of sea-salt. Into the matrass containing the acid plunge a sheet of platinum, into the other a sheet of platinum or gold. If the two sheets be put in communication with the multiplier by means of a wire of gold or platinum, a very energetic current is produced; the sheet of gold, or the first sheet of platinum carries negative electricity to the alkali, the second sheet of platinum positive electricity to the acid. Whence comes this current? Does it arise, as M. Becquerel thinks, from the reaction of the acid on the water, the sea-salt and potassa, or, as M. Fechner and other natural philosophers think, from the contact of the metals with the acid or the alkali? It is a serious and difficult question, the solution of which would be replete with happy consequences. We will now quote the opinion of M. Henrici, who thinks he has completely enlightened this theory. Competent men will judge whether he is not deceived.

Hierz, near Gottingen, June 23, 1839.

"I hasten to send you the description of some experiments, which appear to me to remove all doubt concerning the so much debated question of the origin of the electric current in Becquerel's pile. Being convinced by numerous electroscopic experiments of these two facts:—1st, that the contact of a great number of fluids with the metals, with platinum for example, causes a very intense development of electricity; 2nd, that the contact of two heterogeneous fluids, and even of two fluids which exercise upon one another a chemical action, produces a very weak current;—I was led to call in question the explanation given by M. Becquerel of the curious phenomena observed in his pile, although this explanation had been admitted by other natural philosophers, and to seek a means of uniting the two fluids by a conducting body, which renders any mutual chemical reaction impossible. I attained my object immediately by the following process; into two little cups containing, one a dilute solution of nitric acid, the other a dilute solution of caustic alkali, I plunged the two platinum extremities of my conductor; afterwards I put the two fluids in communication by two of my fingers that I had washed in pure water, and the needle immediately deviated powerfully, and the sense of this deviation was what it would have been if the two fluids had been in immediate contact, for it indicated that positive electricity had passed from the acid into the wire of the multiplier; this effect was reproduced as often as after having withdrawn my fingers from the liquid I dipped them into it again. It is evident that the electric current developed in this circumstance cannot be attributed to a chemical action.

"I afterwards filled a U tube with pure water, the conducting power of which I increased by the addition of a few drops of salt water, and I stopped up the extremities of the tube with corks of elder pith. The tube was then inverted, and one of its extremities was plunged into a glass containing nitric acid, the other into one filled with a solution of caustic alkali; the two liquids were thus separated from one another, so that at first they could not exert any mutual chemical action; but, however, at the moment when the two liquids were in communication, with the assistance of the platinum wire, with the extremities of the multiplier, the needle was briskly moved, and the deviation was 52°. Some bubbles of gas appeared on the wire which was plunged in the alkaline solution.

"This experiment concluded, I withdrew the platinum wire which was plunged into nitric acid, and after having wiped it, I ran it through a cork of elder pith into a tube filled with a solution of caustic alkali, one extremity of which was steeped in a vessel containing nitric acid; this platinum wire was again immediately put in communication with the galvanometer. At the moment when the acid and alkali are joined in the interior of the cork of elder-pith, the needle of the multiplier deviated from three to four degrees, and was fixed at half a degree from its ordinary position; moreover, the sense of the deviation indicated that the current was in a contrary sense to that which I had observed in the preceding experiments. It must again be observed that I had arranged in such a manner that the chemical combination between the acid and the alkali took place while the two platinum wires were plunged in an alkaline solution. From these facts I conclude:

"1st. That in Becquerel's pile the current results, for the most part, on one hand, from the contact of the platinum with the acid,

* L'Institut. No. 317, Jan. 23, 1840.

and on the other, from that of the platinum with the alkali.

"2nd. That the contact of the acid with the alkali gives rise, at the same time, to another current, sometimes of the same sense as the first, but whose intensity is not indeed the hundredth part of the intensity of the whole current of the pile.

"3rd. That the first of these currents may be merely an effect of contact, and that consequently the contact of heterogeneous conducting bodies is, independently of all chemical action, the true source of the electric current; the chemical action entering into the production of this only in a very trifling quantity. These conclusions find a decisive confirmation in the fact that platinum manifests a positive electric tension, if it is in contact with an acid, and a negative electric tension if it touches an alkali.

"By substituting, in the preceding experiments, for the acid and alkali two saline solutions which determine for platinum contrary electric states, or even only electric states of unequal intensity, and which, moreover, by their contact give rise to a phenomenon which indicates the first moment of their reunion; the truth of my conclusions will be ascertained in the most complete manner. I point out the nitrate of mercury and the iodide of calcium as two liquids which are perfectly fit for these experiments. In one of my experiments the principal current produced by the positive electricity which the platinum takes in contact with one of these liquids, and the negative electricity with which this same metal is charged in its contact with the second liquid, made the needle of my galvanometer deviate about 9° and in a durable manner, while the current resulting from the action of the two liquids caused this same needle scarcely to oscillate round the point 0; these little oscillations seemed to indicate a current of a contrary sense to the first. I have not even been able to put in evidence in a certain manner the electrical tension which would result from the contact of these two liquids by employing a condensing electroscope of extreme sensibility."

Observation. The experiments of M. Henrici then seem to him entirely decisive, even in favour of the theory of contact which has always found in Germany numerous and skilful defenders, but which, submitted in France to more delicate tests, would be now almost forgotten without the new labours of M. Péclet. It is ardently to be desired that M. Becquerel or M. Peltier would show the error of the experiments of the learned German. Would it be possible that, concerning a fundamental question, and the solution of which does not seem beyond the present resources of science, superior minds should remain any longer in opposition without being able to come to an understanding even concerning facts. (*Annalen der Physik und Chemie*, 1839, No. 10, p. 272, *et seq.*)

PHENOMENA OBSERVED CONCERNING CARBONIC ACID SUBMITTED TO PRESSURES HIGHER THAN THAT OF THE ATMOSPHERE.

BY M. COUERBE.

Water, at the ordinary temperature and pressure, dissolves nearly its own volume of carbonic acid gas; but if the pressure be increased, we observed that it absorbs nearly a volume of this gas for every pressure: so that the number of volumes dissolved may be known by means of a manometer put in relation with the interior of the vessel. However, this law does not refer to all pressures; and at 5 volumes the pressure often indicates 7, the temperature being at + 15°. There should, indeed, arrive a crisis at which the liquid should lose its solvent power, and the gas should be near liquefying.

Consequently, the gas compressed in a liquid produces various pressures which do not always correspond to the number of the volumes dissolved. Besides, the nature of the liquid should make the results vary.

The experiments which I have made in order to have a view of the phenomenon, were performed in bottles of Champagne, in good condition, supporting 20 atmospheres; this result should present great securities against breaking: nevertheless, when the fermentation of the wine was continued, we were struck with the breaking which occurred at the end of a month, and which is raised, with some merchants of Champagne, to 15, 20, 30, 40 often 50, and even 60 per. cent. Let a manometer be placed on the bottles which resist; it will indicate, at most, 7 atmospheres. The breaking must therefore be owing to some other cause than pressure; or the tension of the gas, for reasons which I am about to explain, must suddenly augment and exceed 20 atmospheres, the force of the adhesion of the glass.

Observation has shown me that, in this liquid, the interior tension is very strong when it contains rather more than 5 volumes of carbonic acid gas; that it is still great when it contains from 3 to 4 volumes, and that between 4 and 5 volumes it never breaks the bottles. The manometer indicates 7 atmospheres.

The singular cause of such a phenomenon, it appears to me, should be attributed to the solvent power of the liquid for the gas which varies with every pressure. The tension will

* *Journal de Pharmacie*, February, 1840.

be so much the weaker as the affinity of the water for the gas is greater.

Consequently, in a mixture of liquid and the compressed gas, there are manifested two opposite forces—the force of solution, or of affinity of the liquid for the gas, and the force of tension. From 3 to 4 volumes dissolved, the force of solution is weak and cannot conquer the force of the tension of the gas; from 4 to 5 volumes, the pressure is sufficient to render, at its maximum, the affinity of the liquid for the gas, and to give the latter a tension equal only to 7. From 5 volumes and upwards, the dissolving power diminishes; then the tension increases, exceeds the adhesion of the glass which is equal to 20 atmospheres, and breaks it. These results, apparently unaccountable, seem foreign to all that we know concerning the solution of gases in liquids.

However, it is well to mind what M. Soubeiran, in his work on the acidulated gaseous waters, says: "One fact worthy of remark is, that notwithstanding the bad quality of the products, the gas contained in the bottles was sufficient to force out the corks at the end of the experiment; but, however, when the liquid came to be examined, but a small quantity of carbonic acid was found in it." According to M. Soubeiran, this fact is an anomaly, and he seeks to explain it by saying, "The operator, by dexterity, might have confined a portion of gas in the neck of the bottle; it might have accumulated there in an atmosphere sufficiently compressed to force the cork out; but there was not any coincidence between the volume of the gas retained in the water and that of its superior atmosphere."

These different phenomena, such as I have presented above, find examples of another nature, and which may be assimilated to them: these are the solutions of salts in water. It is known, indeed, that sulphate of soda is more soluble at 40° than at 20°, or 60°, &c. On this same subject, on a graphic drawing, may be traced a line passing by points of the drawing which indicate the quantity of salt dissolved and the temperature. It is what is called in chemistry a curve of solubility. In this manner, by applying these ideas to the phenomena which we have just explained, I think that by the aid of continued experiments a curve of solubility of gases in liquids at such and such a pressure might be established, and that these varied and apparently contradictory facts might be made to enter into general laws. Thus, pressure on the solution of carbonic acid gas in certain liquids acts absolutely as heat does on the solution of salts in water, and this resemblance seems to me to be demonstrated in the experiments just described.

In the work quoted, M. Soubeiran gives a table of the experiments which tend to show that agitation contributes to increase the tension of the gas; the difference is particularly distinct at the commencement of the operation. "It results," says the author, "that agitation of the liquid has constantly had the effect augmenting the pressure of the gas on the surface, and of making the water lose a portion of the gas which it contained in solution." On this subject, I will say that I have made more than 50 experiments on bottles of Champagne with 5 volumes, and that the manometer, which indicated 7 atmospheres, has not varied half a millimetre, whence it must be concluded, if the observation of M. Soubeiran is correct, that the empty space causes the phenomenon to vary in measure as it varies in size. I say the empty space, because the experiments of M. Soubeiran were made on a cask of the capacity of 115 quarts of water, charged with 4 volumes of carbonic acid gas, leaving a vacuum of 10 quarts on the surface.

In general, when a liquid, like water, contains several volumes of carbonic acid by the effect of a pressure superior to that of the atmosphere, and when that high pressure is removed, the gas escapes instantaneously, and the liquid retains about 1 volume of it; but champagne acts differently; at the moment of the removal of the cork, half a volume of gas escapes; the disengagement continues to 1 volume, when it stops: thus, a bottle may be left a long time uncorked, without the whole of the gas being driven out of the liquid. I am here supposing that we are acting on a well prepared wine, little dried by tannin. This singular fact is owing to an organic matter extended in the whole mass of wine, which absolutely condenses and retains the gas as do certain powders and a great number of porous bodies, even at the ordinary pressure of the atmosphere. —From the *Actes de l'Academie Royale des Sciences de Bourdeaux*, 1re *année*, page 441, 1839.

ON THE TRANSFORMATION OF CALOMEL INTO CORROSIVE SUBLIMATE.*

BY M. MIALHE.

I am about to communicate to the Society of Pharmacy, the summary of some experiments which I have made concerning the transformation of calomel into corrosive sublimate, and which I am momentarily obliged to interrupt.

The following fact, related by Vogel, prompted me to these investigations. A physician having prescribed for a child twelve packets, each containing five grains

* *Journal de Pharmacie*, February, 1840.

of sal ammoniac, five grains of sugar, and one grain and a half of calomel, and the child dying after taking several of these powders, the apothecary was accused of having committed an error in the execution of the order. Happily for our colleague, the accusation against him was of short duration, Peter Koffer having hastened to show that in presence of sal ammoniac and water, calomel is changed into corrosive sublimate. This fact, which I have related in my thesis on aggregation, after having tested its accuracy, has always appeared to me very remarkable, and worthy of fixing the attention of physicians and physiologists. It would not be thus, if the assertion of one of the most distinguished chemists of our school were well founded. This professor assures us, that he has proved, by way of experiment, that the chemical transformation of the protochloride of mercury into the deuto-chloride does not take place under the circumstances described by the German chemist. I will not seek to shew what may be the source of the error into which our learned colleague appears to me to have fallen; I will content myself with publishing here the conclusions which flow from my experiments.

1st. The protochloride of mercury, in presence of hydrochlorate of ammonia, or the chlorides of sodium and potassium, and pure distilled water, is transformed partly into the deutochloride, and into metallic mercury. This transformation takes place at the temperature of the human body, and even at the ordinary temperature, and requires only a few moments contact to be effected. It is sufficient to convince one of this fact, to let calomel remain a few moments in the mouth; a very strong mercurial taste does not fail to be perceived: this taste results from the mutual reaction of the chloride of mercury and the alkaline chlorides contained in the saliva.

2d. It is to the transformation of calomel into corrosive sublimate and metallic mercury, under the influence of sea-salt and sal ammoniac, which are known to exist in the fluids of the digestive tube, that we must attribute the pathological phenomena of mercurial salivation by the ingestion of calomel. What proves that it is really so, is the clinical observation that, when the protochloride does not purge, but is retained for a long time in the digestive passages, it excites, in this case, an anormal excretion of the salivary glands, and that because a greater quantity of corrosive sublimate then results. The same phenomenon also occurs when the use of protochloride of mercury is continued for a long time, and from the same cause.

3d. As there can only ever be formed a quantity of corrosive sublimate corresponding to the quantity of alkaline chlorides which our viscera contain, great eaters of common salt, everything else being equal, should be the most liable to be salivated under the influence of calomel.

4th. The antisyphilitic properties of calomel are probably communicated to it, entirely or in part, by the sublimate and mercury resulting from its chemical decomposition. It is doubtless the same with its anthelmintic virtues; it is by causing the poisoning of the ascarides that the chloride of mercury delivers us from these troublesome hosts.

5th. All that has just been said concerning the medical action of calomel, may be applied to the protiodide of mercury, which, under the same circumstances, is transformed into the deutiodide.

ON THE PREPARATION OF SULPHATE OF IRON.*

BY M. FELIX BOUDET.

The preparations of iron have performed, in therapeutics, for some years, so important a part, that chemists ought necessarily to devote themselves to giving a new degree of perfection to the processes for obtaining sulphate of iron, from which these preparations are almost all derived.

Bonsdorff first, and since, M. Berthemot, have, indeed, described two particular processes, which yielded this salt in a state of purity which was perfectly satisfactory. The only censure they can incur, is that of leading by complicated or expensive manipulations, to results which may be attained by following a simpler method.

It is known that Bonsdorff recommends iron filings to be dissolved in weak sulphuric acid, assisted by a gentle heat; to pour the liquid into a long-necked glass matrass; to add an excess of filings; to boil the solution, and afterwards filter it over a capsule of glass, into which has previously been poured and stirred in every direction, a small quantity of sulphuric acid.

M. Berthemot, directed by laudable views of the strictest accuracy, dissolves purified sulphate of iron in boiling distilled water, adds an excess of iron filings to the solution, and filters it in a vessel in which he had previously placed a sufficient quantity of alcohol, in order to precipitate the sulphate of iron. The product thus obtained is pure, without doubt, but its pulverulent state facilitates its oxidation; besides, this process entails considerable expences to which, if it were necessary, apothecaries must submit, but which may be avoided without

* *Journal de Pharmacie*, February, 1840.

inconvenience, by operating according to the following method:—

Water	1000 grammes.
Sulphuric acid at 66°	330 grammes.
That is to say, sulphuric acid at 20°	1330 grammes.
Pure iron filings, or turnings	200 grammes.

Place the acid in an earthen vessel; add the filings to it by degrees; stir sometimes, and when the effervescence has stopped, pour the whole into a boiler of brass; boil rapidly until the liquid marks 35° of the areometer; pour immediately on filters lightly impregnated with water acidulated with sulphuric acid, and collect in an earthen vessel, into which you have previously poured 12 grammes of sulphuric acid diluted with an equal part of distilled water; stir the solution gently to mix it with the acid, and let it crystallize; the crystals drained at first on the glass filters and dried afterwards with caution and rapidity, should be enclosed in very dry matrasses. This process, of so easy execution, and which is no other than that of the last codex, modified by the addition of sulphuric acid, the idea of which belongs to Bonsdorff, gives crystals of so clear a blue, that they appear almost white, especially when they are of small dimensions, and which may be kept for a very long time with this same colour, which is the best criterion of the purity of sulphate iron.

NEW MODE OF PREPARING CHLORATE OF POTASSA.*

BY M. PELOUZE.

M. Pelouze has communicated to the Philomatic Society of Paris a new and improved process for the manufacture of chlorate of potassa. Until now, carbonate of potassa has been decomposed by chlorine; M. Pelouze having noticed the inconveniences of this process, proposes to remedy it by substituting soda for potassa. If a proper method be adopted, sea-salt and chlorate of soda are obtained; and afterwards, by double decomposition, the latter is formed into chlorate of potassa, in treating it with one of the cheapest salts of the potassa of commerce. M. Pelouze pointed out a second process, which might be employed with advantage in the same manufacture: it consists in passing chlorine into milk of lime; chloride of lime is then formed, which is afterwards boiled for a long time with muriate of potassa.

* *L'Institut*, No. 318, Jan. 30, 1840.

ON THE RED COLORATION OF ROCK-SALTS.*

BY M. MARCEL DE SERRES.

The author suspecting that the cause which colored certain rock-salts red might be the same as that which reddens the waters of salt marshes, undertook some investigations on this subject, in concert with M. Joly, who was already occupied with the latter phenomenon.†

Having put under the object glass of a microscope a small portion of rock-salt with a drop of water, the salt was seen to dissolve, and the solid part which remained presented itself in little reddish grains, whose form much resembled that which the animalculæ of the waters of salt marshes take after death. In submitting to the same test colorless rock salt, there was discovered in it, but in less abundance, the remains of the same species of animalculæ (*Monas Dunalii*, according to M. Joly), but in neither have they found any traces of the *Artemia salina*.

Colored rock-salts, from many different localities, were afterwards examined. They were dissolved in distilled water, and by filtering, a residue entirely composed of bodies of organic origin was obtained; some spherical (the animalculæ); others very long, like *Bacillaria*, and others red like the first, but flattened and of a polygonal form, which might be considered as silicious carapaces having belonged to animalculæ.

This residue, exposed to heat, was not very sensibly discolored; but what indicated its animal nature, was the empyreumatic odour which was disengaged and the action of these emanations on reddened turnsole paper, which they in a perceptible manner returned to blue.

However, adds M. Marcel de Serres, I ought not to disguise that a sample of rock-salt which we have sent to M. Berard to analyse, is blackened when exposed to a high temperature, and that, although an empyreumatic smell is perceptible, the reddened turnsole paper has not been returned to blue, which indicates, in this sample, a greater proportion of vegetable substances than of animalculæ.

ON THE ESSENTIAL OIL OF MUSTARD.‡

BY MM. ROBIQUET AND BUSSY.

Organic chemistry offers at the present time a crowd of remarkable products, which

* *Comptes Rendus*, No. 8, Feb. 24, 1840.

† See *Comptes Rendus*, t. IX. p. 570.

‡ *Journal de Pharmacie*, February, 1840.

deserve, in the highest degree, to attract attention; but there are few among them more interesting than the essential oil of mustard. Indeed, every thing is remarkable in this singular product. Most essences are contained in peculiar organs, and we are informed of their presence by the more or less agreeable aroma with which they pervade the air. Here is nothing of the kind: the seed which yields us this keen and penetrating essence exerts no action on the smell. Moreover, it does not pre-exist, and we are now able to prevent or cause its production; and while other essences admit but few elements into their composition, which is even confined to two, this reckons more than four, and in this number azote and sulphur are met with. It is the only instance we have of the presence of the latter in an essential oil. It may be conceived, that, if ordinary organic products have so often been able to puzzle all provisions, or to escape the various theories which they give rise to, this more complex one will still long elude all our efforts, at least in a collective and general point of view; and it will be by much extending our observations alone, that we can hope to open a road into this new labyrinth. We must not then be surprised to see this substance studied by several chemists successively. It is also certain that there are good and useful observations to be made by all, and that such a subject will not so soon be exhausted; but, as that which one perceives another may also see, it is right that each should hasten to publish the result of his observations, in order to have the benefit of them. Such is the object of this note.

It is nearly two years since M. Bussy and myself first proposed to study this question; but after having devoted a whole vacation to it, without any great success, our necessary occupations obliged us to renounce this undertaking. However, not wishing that either of us should profit exclusively by that which we had done in common, we have thought fit, on the present occasion, to deposit here the little we have learned. We will first say, that the essential oil of mustard, obtained by the ordinary means, being submitted for several consecutive hours to a temperature of 100° in a distilling apparatus, allows to be volatilized, probably by assistance of a little moisture, a small quantity of a very fluid product; it is colourless, of a faint and somewhat etherial smell, not mixing with water, but communicating to it a sweet taste, like some ethers. The residue of this operation, that is to say, nearly all the essence, gives, by distilling with water, products whose density always goes on increasing; the first are lighter, and the last heavier, than the water.

If essential oil of mustard be rectified on the open fire, and so as to be able to ascertain the temperature, it is seen that ebullition commences towards 110°, afterwards it rises gradually to 155°, at which point it remains stationary during the remainder of the distillation. If, setting aside the last product, the first portion collected be rectified *de novo*, it will be observed this time that the liquid enters into full ebullition at 90°; and if the recipient be changed when the thermometer reaches about 130°, there are thus separated three products, whose densities are as follows, viz.:—

1st. From	90° to	130°	density 0·986
2nd.	130°	155°	1·009
3rd.		155°	1·015

What is very surprising is, that the lightest of these essences is also the deepest coloured; its tint is lemon yellow. The last is almost colourless.

This variation of density announces, to all appearances, a difference of composition; and thence arise, without doubt, the anomalies remarked in the analyses of this essence which have been published. We will endeavour to ascertain this.

The essential oil of mustard, shaken for some time in a close vessel with a concentrated solution of caustic potassa, is almost entirely dissolved, and the solution retains but little smell, but it acquires more or less of a brown colour. If, after some days' contact, this alkaline liquid be saturated by tartaric acid, there is formed a deposit of little, white, radiated crystals, which are not cream of tartar, but whose real nature is still unknown to us. Some drops of oil swim on the surface of the saturated liquid. By its distillation is obtained a deep yellow and very alkaline product, forming a blackish brown precipitate with the solutions of lead, while the residue of the solution gives, under the same circumstances, a white precipitate. It appears, therefore, that the sulphur abandons the saturated liquid to pass off with the distilled product, and necessarily in quite another state of combination.

In the few observations that we have been able to make concerning this curious essence, there is none which has appeared to us more important than that we are about to mention: it will fix, we think, the attention of chemists. That singular product will be remembered which was obtained by MM. Dumas and Pelouze, by making ammonia, whether liquid or gaseous, act on the volatile oil of mustard. This reaction did not realize the expectations which occasioned it to be tried, but it gave place to very remarkable results, of which, perhaps, the least astonishing is to see the very keen and irritating smell of each of these two bodies totally annihilated by their union. It suffices, to combine them, to put them in the vessel; the reaction operates of itself,

and without the necessity of multiplying the points of contact by agitation; then, by simple exposure to the open air, the excess of ammonia is dissipated, and long, fine, white, inodorous prismatic crystals are obtained, as neutral, at least, as if the ammonia had been saturated by a powerful acid. The union is ever such that it offers more resistance than the ordinary ammoniacal salts, for it would be useless to attempt to drive away the ammonia by a more energetic base and by any means; according to MM. Dumas and Pelouze, the essential oil of mustard cannot be withdrawn from it. So that had these crystals been found before it was known how they were produced, it is to be presumed that the origin of them might have remained long unknown. It is very certain that the authors of this beautiful discovery, not seeing in what category this singular compound might be ranked, have proposed to consider it as an amide. Whatever it may be, we will say, and it is the principal fact that it is important for us to make known here, that these crystals, which seemed not to be attacked by any chemical agent, are decomposed with the greatest facility by the contact of the binoxide of mercury. The reaction of these two bodies, when they are dry and well porphyrized, and mixed in the proportion of five of oxide to one of the crystals, is instantaneous, we will say even almost volcanic; heat, liquefaction, and vapours are produced; the colour becomes of an intense black; this phenomenon results, according to all appearance, from the combination of the sulphur with the mercury. This mixture immediately becomes alkaline, without any development of ammonia. Not only is there none perceptible to the smell, but the most sensible reagent, weak hydrochloric acid, does not discover the slightest trace of it, even at the moment of the most powerful reaction. Moreover, this action being terminated, if the mixture be washed, either with ether or with pure water, a solution is obtained which, filtered and dried in the vacuum, leaves a viscous and somewhat oily residue, very alkaline, which treated when cold by caustic soda or potassa, does not disengage ammonia, and which, on the contrary, added to an ammoniacal salt, deprives it of a little alkali. The aqueous solution of this product is precipitated abundantly by tannin, combines with the acids, being saturated, and furnishing with some of them crystallizable products. Thus, without entering into longer details, it is evident at present, that this new body which results from the reaction of the binoxide of mercury on the crystals of MM. Dumas and Pelouze, presents the principal characteristics of organic alkaloids, and that this alkaloïd is found there quite formed; and that it derives its origin from ammonia, but that it does not contain any. Let us remark, in conclusion, that this new fact comes to the support of an opinion given long since by one of us, namely, that it was to be presumed that the alkalinity of organic bases is derived from ammonia.

ON THE VOLATILE OILS OF MUSTARD AND HORSERADISH.*

BY MM. BOUTRON AND FREMY.

By passing, with extreme caution, a current of chlorine into a little tubulated retort, containing volatile oil of mustard, silky crystals are obtained, which are volatile, and endowed with great cohesion; they are insoluble in water and ether, and soluble in alcohol in all proportions.

Potassa converts them into a resinous matter, insoluble in that alkali. Air alters and colours them. If a great excess of chlorine be passed over these crystals, they are resolved into a viscous liquid, and the crystals can never be reproduced.

Caustic potassa exerts on the volatile oil of mustard a most violent reaction; when the bell-glass containing these two substances is gently heated, hydrogen is disengaged, as in the reaction of the same alkali on benzoil, and a soluble salt of potassa results. The acid of this salt is oily, insoluble in the water upon which it floats, but soluble in alcohol.

Horseradish contains the same matters as black mustard, and the volatile oil may be obtained from it by causing the emulsin of white mustard to act on the inodorous alcoholic extract of this root.

Horseradish, in its natural state, is completely inodorous, and the volatile oil appears to be formed only when the root is cut or divided.

EXPERIMENTS ON THE INFLAMMATION AND COMBUSTION OF GUNPOWDER.† [1]

BY M. PIOBERT.

These experiments complete those which the author has consigned in a preceding *Memoire sur la Théorie des effets de la Poudre*, which memoir the Academy ordered to be inserted in the *Recueil des Sa-*

* *Journal de Pharmacie*, February, 1840.

† *Comptes Rendus, No.* 8, *Feb.* 24, 1840.

[1] In mentioning here several memoirs and pieces of correspondence which had arrived before the sitting of the 17th of February, and which time has not allowed to be communicated to the Academy, we have taken care to distinguish them from pieces which have been sent latterly.

vaux étrangers; they confirm the laws of combustion and inflammation which were established in this first work, regarding powder at present in use in war, and show that these laws apply equally to all other kinds of powder.

The matter of which the grains of powder are formed burns in successive layers, of which the thickness is about 13 millimetres per second, when this matter is of an ordinary density, (one and a half that of water), and varies in inverse ratio as the density.

The rapidity with which fire is propagated in a charge, from one extremity to the other, increases rapidly with the resistance of the envelope, and especially when there exists a vacuum in all the length; in firearms it is always very great, and so much the more as the grains leave between them a larger passage to the flame; in the case of long charges, without projectiles and inflamed from the side of the mouth, may break very thick wrought iron cannons. But this quickness of inflammation diminishes rapidly as the powder contains more charcoal dust, and when all the interstices which existed beween the grains and the length of the sides of the envelope are filled by this charcoal dust, the communication is slower; there is then no more than a combustion like that of fireworks, and the gases only act more weakly against the sides of the firearm. Indeed, if all the matter is in powder, combustion produces only a slight flame, and its speed is only about nine millimetres per second, while, in powder in grains, the celerity of the transmission of the fire is more than twenty metres.

These facts show the possibility of relaxing considerably the inflammation of masses of powder, by mixing the grains with the charcoal dust, or with one of its components, very finely triturated; the explosion would then be changed to a combustion, which would offer more to the same degree, the dangers which this energetic agent actually presents in its conservation.

ON THE ACTION OF CHLORINE ON QUININE.*

BY M. J. J. ANDRE'.

Gaseous chlorine put in contact for some moments with pulverized quinine, gives it the colour of red carmine, and renders it soluble in water. The solution becomes green by ammonia, unless it has been heated for some time, which makes it brown, as does also too prolonged an action of chlorine. The basic sulphate of quinine is less strongly attacked than the base itself.

In order to produce red colouring, when water intervenes in the action of chlorine on quinine, the latter must be light enough to float in great part on the liquid, and its parts, however, must preserve a certain mutual adhesion; accordingly it is proper to use quinine very dry, but yet not dishydrated. All that tends to put as great a quantity as possible of vegetable alkali in direct relation with a moderate current of chlorine, favours this colouring; all that tends to facilitate the division or solution of the quinine prevents or destroys it in proportion as it appears.

If the chlorine continues to come without interruption for three quarters of an hour or an hour into a kilogramme of water holding in suspension 5 grammes of quinine, it is remarked that the liquid after the complete solution of the akaloid becomes turbid and precipitates a white matter; at the end of an hour and a half, all the quinine may be regarded as disorganized; it no longer grows green by ammonia, which would indicate that some still existed.

The white matter being washed in order to remove the hydro-chloric acid, and dried in the shade, is pulverulent, rather fawn-coloured, very light, very difficult to be impregnated with water, dissolving in water by the aid of heat, but then passing to a reddish-brown state. It is soluble in alcohol, and the solution, which tastes very bitter, reddens blue turnsole paper; it is precipitated by nitrate of silver, acetate and subacetate of lead: the acids attack it with difficulty, even when pretty much concentrated; it is very soluble in the alkalies.

By the imperfect saturation, by means of alcohol and soda, of the liquid which has precipitated it, we obtain a new quantity of white matter which disappears if we wish to arrive at an entire neutralization: it disengages itself besides from the chloride of azote, which is recognized by its smell and by drawing tears from the eyes. This second portion of white precipitate is more soluble than the preceding; it passes more easily into the state of red-brown matter when it is in contact with oxygenated bodies: it appears united to some hypochlorite of soda.

If we completely saturate with quinine the chloruretted solution, at the first impression of heat it grows yellow, then brown; from alkaline its reaction becomes acid. By evaporation to dryness, a red-brown acid matter is obtained, containing much chloride of sodium and hydro-chlorate of ammonia. Alcohol at 33° separates the greater part of it from the salts; there remains then an extractive matter almost insoluble in alcohol

* *Annales de Chimie et de Physique.*

at 40°, dissolving readily in water, and precipitated by nitrate of silver, acetate and subacetate of lead: the sulphate of iron produces no change in it; it has a bitter taste. This substance, like the white matter, on being heated with a little hydrate of potash, gives out some ammoniacal vapours, an effect which I think less attributable to azote which might have retained these substances, than to a certain quantity of ammoniacal salt from which they could not be freed.

How does chlorine act on quinine? I think that that energetic agent forms with water hydrochloric acid and chlorous acid. The latter yields oxygen to the organic matter which at first loses its basic property, then is converted into a white resinoid matter susceptible of taking a new quantity of oxygen whether in coming in contact with the air, or with a hypochlorite, and of being then transformed into a red-brown extractive matter. Another portion of the chloric acid determines, by means of the elements of ammonia contained in the alkaloid, the formation of chloride of azote. The ulterior decomposition of this last body and of the hypochlorite of soda sufficiently explains the production of the hydro-chlorate of ammonia and of the chloride of sodium. There ought also to be a formation of carbonic acid.

It may readily be conceived that the phenomena which result from the action of chlorine or quinine, may be applied equally to the other alkaloids, except some particular facts. In continuing the reaction longer, it is to be presumed that the chlorine would convert them into oxalic ocid or any other very oxygenous acid.

ACTION OF CHLORINE AND AMMONIA ON QUININE.

When, in 1835, I pointed out the emerald-green colour as resulting from the action of quinine or its salts submitted successively, in a weak solution, to liquid chlorine and some drops of ammonia, I could not explain the formation of that colour and its little stability; I expect to be more fortunate now, and to add some facts to that curious reaction.

Thus ammonia, poured little by little, shaking every time, into the chloruretted solution of quinine, does not always make it pass to emerald green; it may present all the shades resulting from the mixture of green and red in different proportions, which has reference to the decomposition of a part of the green matter in presence of an excess of chlorine, and to its transformation to a red substance, of which we will speak further on. Another obstacle to producing the colour of emerald green, is the presence of a brown substance resulting from the prolonged action of the chlorine on the quinine, but by destroying it by a new quantity of chlorine, we give to the vegetable alkali, not disorganized, the property of becoming green by ammonia.

We have shewn before, the manner in which chlorine acts on quinine: here only the action is less energetic, since it does not last long; the vegetable alkali is not entirely disorganized, and in that state of alteration, it is precipitated green by ammonia; but the latter, in contact with chlorine, acts as soda or potash would have done, there is a formation of a hypochlorite of which the little stability is known; accordingly in becoming decomposed it oxygenizes by degrees the green substance at the ordinary temperature, it grows brown, and afterwards reddish brown. By heat the reaction is much more prompt, the green ammoniacal liquid loses by evaporation the free ammonia which rendered it alkaline, it becomes acid and assumes a red colour.

The green substance is well obtained by mixing 2 grammes of basic sulphate of quinine, and 500 grammes of liquid chlorine; they are allowed to re-act for 10 minutes, then the mixture is poured in about equal parts into half a dozen glasses containing from 5 to 6 grammes of ammonia. The precipitates formed are put on the filter; this being almost dried in a vacuum, is submitted to alcohol at 40°, and the tincture obtained evaporated in the same manner protected from the air. Notwithstanding these precautions, this substance cannot be preserved without alteration; it ends always by being transformed into a red substance; however, it is very soluble in alcohol, in ether, but less in water; the taste is bitter; being warmed in water, it grows brown, and afterwards grows red by the acids.

By evaporation of the chloruretted and ammoniated quinine, there remains a blackish-red substance adhering strongly to the sides of the capsule. Submitted to alcohol at 40°, which isolates almost all the hydrochlorate of ammonia that has been formed, a solution is obtained of a beautiful red carmine. The acids make no change in it; the alkalies precipitate from it a matter of a violet-red colour: chlorine takes the colour out, and by adding ammonia it no longer grows green. What seems to prove that this substance still contains quinine is, that we have only to add to it lime crumbled, then to submit the dry precipitate to alcohol at 36°, we obtain a solution of a light rose colour, which becomes green after having been successively put in contact with chlorine and ammonia.

The concentrated solution of red matter in the alcohol at 40° allows a part of that substance to be precipitated by the addition of a certain quantity of water; being dried, it is of the colour of wine-lees bordering on

rose-colour, being re-dissolved into red carmine in alcohol and in ether, not altering in the air.

By soda or potash, the solutions of chloruretted quinine do not become green, but grow more or less brown; the alcoholic tincture obtained by means of the evaporated product is not a sufficiently beautiful red

To sum up this series of experiments, we may see that under the influence of chlorine, quinine tends to become oxygenized more and more; that it may give birth to four distinct compounds having scarcely any common property except their bitter taste, which reveals their origin.

1. A green substance, very little permanent, a kind of combination of quinine and a substance analogous to the resins. 2. A carmine red substance of the same nature as the preceding, but more soluble and permanent, and more oxygenized. 3. A resinoid white substance, having a strong affinity to oxygen and very soluble in the alkalies. 4. A reddish-brown substance possessing all the characters attributed to the pharmaceutical extract in its greatest purity.

ACTION OF ARSENIC ACID ON THE SUGAR OF THE CANE.*

BY M. L. ELSNER.

Professor Runge makes use, as is well known, in order to discover the smallest quantities of free sulphuric acid, of a solution of 1 part of sugar in 30 parts of water: he spreads this solution over a plate of porcelain, heats it to 100° by steam, and then pours on it, drop by drop, the liquid in which he is seeking for the free sulphuric acid; the black colour which is formed at the place touched makes him infer the presence of that acid. M. Runge directs attention to the fact, that phosphoric acid and other free acids do not decompose sugar in that manner; but arsenic acid must be excepted, as I am going to shew.

I had already, in 1827,† been the first to call attention to the remarkable red colouring, presented by different species of sugar, when they are left long in contact with concentrated solutions of arsenic acid in water, an interesting phenomenon, of which I attempted to give an explanation in 1831.‡ I shewed that in that reciprocal action of cane-sugar and arsenic acid, both undergo an alteration; that in fact the first passes into a state of grape-sugar, and that the arsenic acid is brought partially to a degree of inferior oxidation. I then accounted for this reduction by the action of the carbon, which was separated from the sugar in the way of decomposition, and the red colouring produced in the solution of the sugar by the separation of carbon to a state of extreme division. M. Malaguti has shewn, in his memoir on the action of diluted acids on cane-sugar,§ that ulmic acid is then formed, and among the acids mentioned as producing that change is also found arsenic acid. Thus, that which I before took for very minutely divided carbon has been recognized, by a more attentive examination, as an acid very rich in carbon, of which the gradual formation is the cause of the red colouring, when the solutions of sugar and arsenic acid experience a reciprocal reaction. After having read the instructions of Professor Runge on the investigation for free sulphuric acid, I have tried, in the same manner, the action on sugar of very weak solutions of free arsenic acid, and I have found the following results:—

Over a plate of porcelain was spread a solution of 1 part sugar in 30 parts water, heated by the steam of boiling water, and then sprinkled with a drop of a solution of 1 part arsenic acid in 100 parts water: at the end of some seconds of reaction there was formed at the edge a red streak, which gradually grew broader, and at length produced a beautiful crimson spot on the white china plate.

With a solution of 1 part arsenic acid in 300 parts of water submitted to the operations already mentioned, there was formed at the edge a manifest streak of crimson; the spot exhibited an orange colour towards the centre.

A solution of 1 part arsenic acid in 1200 parts water produced, under the same circumstances, on the edge only, a small red streak, which was only of a yellow colour towards the centre.

With a solution of 1 part arsenic acid in 1800 parts water, there was no more any change of colour, and I could not observe on the china plate anything but a bright varnished surface, formed by the evaporated solution of sugar.

Thus it results from these researches, that the free arsenic acid, in acting on the sugar under the same circumstances as free sulphuric acid, produces also a shade of colour, which certainly is not visible with so weak a solution as is observed with free sulphuric acid, according to M. Runge, but which yet deserves in all cases to be quoted immediately after the reactions of sulphuric acid.

* *Journal de Pharmacie.*

† See *Schweigger's neue Journal für Chemie*, vol. xx. page 348.

‡ See *Schweiggerseidel's neue Journal für Chemie*, vol. i. p. 350.

§ See *Journal de Pharmacie*, Sept. 1835, p. 443 to 457.

Professor Hünefeld has shewn again that the sugar of milk, gum, &c., is also blackened by free sulphuric acid under the same circumstances as sugar.

ON THE COLOURING MATTER OF THE POLYGONUM TINCTORIUM.*

BY M. COLIN.

M. Colin has addressed a Memoir to the Academy of Sciences, containing the results of the new researches which he has made on this subject. The results to which he has been led; and which differ in several respects from those which he had thought that he could deduce from preceding experiments, are thus summed up.

Oxygen alone does not produce the blue in the infusion of polygonum made with boiling water, neither does the open air produce it; but both make the infusion blue with water at 65°.

Sulphuric acid produces only a purple red, whether it is employed alone or with the addition of azote; but on contact with the air, or with oxygen, that acid always produces blue in the aqueous infusions of polygonum.

Lime-water deprived of air precipitates the infusious of polygonum into a bluish or greyish white; it produces nothing more in it, in presence of azote: but by introducing oxygen it generates green in the infusion made with boiling water, and blue when water at 65° is used.

Accordingly, oxygen is necessary to the production of indigo blue only. It could not, any more than oxygen, produce that colour cold in an infusion prepared at the temperature of 100°. However, water deprived of air may with impunity be heated to the boiling point, provided the leaves of the polygonum tinctorium are kept from the contact of that gas; for then the infusion becomes blue on contact with the atmosphere, as if it had been prepared at a temperature of 65°, and the precipitate which results from it is no less abundant. It is, therefore, not indifferent whether boiling water is thrown on the leaves in question, or whether the boiled water which covers them, be gradually raised from the ordinary temperature to that of 100°.

* *Journal de Chimie Medicale*, Feb. 1840.

ANALYSIS OF BONES AFFECTED WITH SOFTENING.†

M. Rees, several of whose essays we have already made known, has analyzed bones affected with softening:—The following are the results obtained:—

DISEASED AND SOFTENED BONES.

	Earthy Matter.	Animal Matter.
Skin. . .	32·50	67·50
Rib . . .	30·00	70·00
Vertebra .	26·13	57·42

BONES TAKEN FROM A MAN IN A HEALTHY STATE.

	Earthy Matter.	Animal Matter.
Skin. . .	60·02	39·98
Rib . . .	57·49	42·51
Vertebra .	57·42	42·38

The same order in the proportions of earthy to animal matter is therefore observed in diseased and in healthy bones.

M. Rees having repeatedly analyzed the earthy matter of the long bones of the extremities, and that of the trunk in a healthy state, and having found in the first 86 parts in 100 of phosphate of lime, and 83 in 100 in the latter, submitted to the same analysis the earthy matter obtained from the skin, the rib, and the vertebra, in the softened state, and found only 78 parts in 100 of phosphate of lime.

He concludes from this result that in the earthy matter which is absorbed, phosphate of lime predominates.

† *Journal de Chimie Médicale*, Feb. 1840.

II. CHEMICAL MANUFACTURES.

EXPERIMENTS ON THE FORMATION OF BLEACHING POWDER.

BY JAMES S. MUSPRATT, ESQ., OF LIVERPOOL.

Having been induced, whilst studying at the London University, to make some experiments on bleaching powder, I entered upon the subject about ten months ago. I had not proceeded far with my experiments before I left London, and did not bestow farther attention on the subject until within the last four months, when circumstances enabled me to avail myself of the valuable assistance of Mr. James Young (late assistant to Professor Graham.) Aided by him, I commenced a series of carefully conducted experiments, and have obtained results which appear curious, and may tend to remove some of the doubts relative to the

composition of this important article of commerce. Many theories have been brought forward concerning the composition of this compound. At one time it was supposed to be a hypochlorite of lime with chloride of calcium; but this theory seems latterly to have died away. From the following experiments its composition may be easily seen.

1st *Experiment.* — Passed chlorine gas over pure lime (Ca); but after the chlorine had passed over it for four days there was no increase of weight, which proves that lime will not combine with chlorine gas unless water be present.

2nd *Experiment.* — Passed dry chlorine gas over perfectly pure protohydrate of lime (Ca H) until the augmentation of weight ceased: this was when the protohydrate of lime had taken up 36·2 per cent. of the gas.

3rd *Experiment.*—Took an equivalent of protohydrate of lime (37·54), and mixed it intimately with an equivalent of water. The mixture was then submitted to a stream of chlorine gas. In this experiment the additional atom of water caused the protohydrate of lime to take up from 45 to 46 per cent. of the gas, which is about 9·06 per cent. more than the protohydrate of lime took up by itself.

4th *Experiment.*—Mixed intimately equivalent proportions of protohydrate of lime and chloride of sodium, and submitted the mixture to a stream of chlorine gas. In this experiment the chloride of sodium caused the protohydrate of lime to take up the same quantity of chlorine as the second atom of water did in experiment third. The chloride of sodium cannot have acted chemically: it must have acted merely mechanically, and so must the second atom of water, for the additional atom of water is no more essential to the formation of bleaching powder than the chloride of sodium, or any other salt.

I replaced the water by chloride of barium (Ba Cl), chloride of potassium (K Cl); sulphate of lime (Ca $\ddot{S}$); sulphate of barytes (Ba $\ddot{S}$); crystallized sulphate of soda (Na $\ddot{S}$+10 H); caustic lime (Ca), &c.; and I found that any of these salts when mixed with protohydrate of lime caused it to absorb 9 or 10 per cent. more of chlorine gas.

From the foregoing experiments, the composition of bleaching powder, containing 36 per cent. of chlorine, appears to be a subchloride of lime, with an essential atom of water; and bleaching powder containing 45 per cent. of chlorine, a subchloride of lime, with an essential, and also a mechanical atom of water.

When the last-named compound is rubbed in a mortar with perfectly dry chloride of calcium, a quantity of chlorine gas is liberated.—Why? Because the chloride of calcium being a hygrometric body, takes the mechanical atom of water from the compound, and the superfluous chlorine escapes.

The chlorine gas for the preceding experiments was made by adding hydrochloric acid to chlorate of potash. The gas, before it came into contact with the different mixtures, passed first through water and then through two glass tubes containing chloride of calcium, so that it was perfectly pure and dry.

The experiments made afterwards by Mr. Young coincided very closely with those I have stated; 1 per cent. being the greatest difference in any of them.

METHOD OF BLEACHING AND REFINING PALM OIL, ANIMAL AND VEGETABLE OILS, ETC.

BY CHARLES WATT.

It may be unknown to most of our readers, that Palm Oil is an article of very large consumption among soap-makers, in consequence of its being generally cheaper by more than ten pounds per ton than tallow.

The great difficulty, however, of employing it for soap-making, in large quantities, arises from its colour, which is of a deep blood red. This it has long been an important desideratum to remove; and various processes, more or less successful, have been adopted for the purpose.

After a great number of experiments, I have been enabled to establish a method of effecting this, which has been in full operation at most of the largest establishments in the kingdom, and which has met with the most unqualified approbation of their proprietors, who have consequently given the highest testimonials of its value.

For this process, I have obtained a patent; and therefore I shall give a brief description of its various parts, in order to ensure the due effect of the operation, and to render perfect the purity and decoloration of the oil.

In the first place, however, I may remark that I had long been of opinion, that the colouring matter of the oil depended upon a peculiar vegetable principle, held in solution by the elain, or oily part, and not by the stearine; as, when separated by any chemical means from the elain, the stearine is perfectly white.

My object, therefore, was to decompose this peculiar substance without injuring the oil.

Chlorine and its compounds, which are generally resorted to for bleaching, I found to be not only expensive and very trouble-

some, but to give a brown and dirty colour to the oil, and also to weaken and injure it, so as to make it much less fit for the purposes to which it is generally applied.

I conceived that the most effectual method of removing the colour would be, to operate upon the oil with some compound which contains a large quantity of oxygen, and readily gives it up when placed in contact with other bodies. The substance which I found to answer this purpose, was chromic acid, which I employ in the following way:—

I cause the oil to be boiled in a steam-vessel for half an hour, then left to settle, and cool down to about 130° of Fahrenheit's thermometer. After this, I direct it to be removed into wooden vessels, each capable of containing about half a tun; great care being taken that no water or sediment, which is chiefly vegetable matter, is introduced; as, if any of the latter be present, it decomposes the chromic acid, and consequently prevents its effect upon the oil.

For the oil, thus cleared from all extraneous matter, I prepare the bleaching materials in the following quantities:—For one tun, viz., twenty-five pounds of bichromate of potassa, dissolved in no more water than is sufficient to make a saturated solution, to which is carefully added, about eight pounds of strong sulphuric acid, and about fifty pounds of muriatic acid; or the same weight of common salt may be employed, in which case sufficient sulphuric acid must be used to decompose it.

This mixture is then put into the oil, which is constantly stirred,—a very important part of the operation. In a few minutes, the colour of the oil changes, first to a black, then to a dark green, which soon again changes to a very light green, accompanied with a thick froth on the surface. This froth and light green colour, are proofs of the good colour of the oil, and the completion of the process

I may here observe that if, upon taking out some of the oil, it is not found to be sufficiently decolored, a further quantity of the bleaching compound may be added to render the oil sufficiently white.—When the process has been well managed, and the articles of the mixture have been pure, I have seen a tun made quite colourless in five minutes.

During the process, a very powerful kind of action seems to be going on, and the oil loses that heavy and glutinous consistence it possessed before the operation.

After the oilis quite white, I let it settle for about half an hour, to allow the chemical matters that have been employed to subside. It is next to be pumped off from these matters into a wooden vat, provided with a wooden or leaden steam-pipe, and to be boiled for a few minutes with some fresh water. It is then to be finally settled, in order either to be packed in casks or removed into the soap-copper.

It is almost needless to remark, what all chemists must know, that the chromic acid loses its oxygen during the process, and becomes the green protoxide of chrome: it is this decomposition which acts so important a part in the operation. It has another beneficial effect—it prevents the bad effects which the chlorine liberated by the decomposition of muriatic acid causes in making the oil to become of a brown or foxy colour, as it is termed by the workmen, and in injuring the consistence of the oil; whereas by the process I have described, the oil is rendered much harder.

The fluid vegetable oils, such as linseed, rape, and mustard, may be decolored by a dilute solution of chromic acid. As, however, in these oils the oxide of chrome combines with the glutinous matter they contain, I have found it better to add to the solution a little muriatic acid, which entirely prevents that effect; but I do not approve of more than just enough for the purpose, and I prefer adding it at the end of the operation, as it then combines with the oxide of chrome, without injuring the oil.

The oil is then to be washed with water, to free it from any acid; and it may here be observed, that in the bleaching as well as washing, a temperature of about 120° may be beneficial. The oil is then to be filtered, or to be kept warm long enough to settle, which will require about twelve hours.

In the case of olive oil, oil of almonds, and castor oil, no muriatic acid is requisite or proper.

With fats and fish oils, I proceed thus. If they be in a very bad state, and have been rendered when putrid, or have been charred, they must be boiled in the before-mentioned steam apparatus for half an hour, with a weak ley, containing about half a pound of pure soda to every ton of such fat. When this process is finished, there is added about half a pound of sulphuric acid, diluted with about six times its weight of water; it is then boiled for about fifteen minutes more, and allowed to settle for at least an hour; when the water and sediment may be drawn off, and it may be further bleached and refined by a solution of chromic with sulphuric acid.

In most cases, about four pounds of bichromate of potassa, and about two pounds of sulphuric acid, will be sufficient; but this must be regulated according to the colour and impurity of the tallow under operation.

Many base attempts have been made to pirate and infringe this patent by the ridi-

caloua substitute of common salt for muriatic acid in the process of bleaching. This is, of course, a silly subterfuge, which the specification provides against, and which shall be made fully evident, when I have information that any parties are thus infringing my right.

REPORT CONCERNING A WATER-PROOF SOAP.*

BY M. ROBIQUET.

M. Menotti presented some months ago a soap which, according to him, possessed the property of rendering tissues impermeable to water, without depriving them of permeability to the elastic fluids. Many samples of stuffs prepared by this means accompanied this soap. M. Dumas and myself have been appointed to examine them, and give our opinion of them to the Academy. We now come to acquit ourselves of this duty.

The utility of the result published by M. Menotti has been so generally felt, that for a long time it has been the subject of numerous experiments, and more or less happy applications; but, in general, the means hitherto employed have been so expensive, that these tissues could be purchased only by wealthy people; that is to say, by those who need them least. It has been the object of M. Menotti, on the contrary, to render them accessible to all, and to put the application of his method in the hands of every one. This method is indeed so easy, that there is no one who cannot put it in practice; for it consists simply in steeping a perfectly dry stuff in an almost boiling solution of this waterproof soap. When the stuff is uniformly impregnated, it is moderately wrung, left to dry, and all is terminated.

To assure ourselves of the truth of the facts alleged by the author, we went to his establishment, and there M. Menotti, who had told us the composition of his soap, prepared some before us. Many pieces of stuff were rendered impermeable; and that the indicated effects might become more evident to us, M. Menotti sprinkled some pieces of cambric muslin with the warm solution of his soap; he even traced some characters with this same solution. When the stuffs were dry, not a vestige of this preparation was visible; but when it was steeped in boiling water, immediately all the parts which had been impregnated with this soap were perfectly distinguished, and all the primitively traced characters were seen to reappear, because all that which the soap had touched not being allowed to imbibe, it results that the difference of shade renders these different parts very distinct from one another.

Indeed, we have sufficiently repeated the experiments, together and individually, to be able to say that we think M. Menotti has really attained the object which he proposed, and that as regards both utility and economy. Thus we have ascertained, by taking for a basis the price fixed by M. Menotti for his soap, that it will be possible, at a few centimes' expense, to render several metres of linen waterproof. To give a more precise idea of it, we will say that it will not cost more than 40 centimes to render an ordinary blouse impermeable, and about double as much for a soldier's cloak.

It is, doubtless, unnecessary to remark, that the closer the texture of a tissue is, the greater will be the impermeability. We will add, that it would probably succeed much better by impregnating with this soap, not only the tissue itself, but the first matter which served to manufacture it; it is, indeed, what M. Menotti has proposed to do, and as his preparation modifies very little the pliability of the textile fibre, he looks upon success as certain.

The immense advantages which would result from the adoption of a process as simple as economical, are evident; as well as the many obligations all those who enjoy the sad privilege of exercising any profession whatever on the public way, exposed to the injuries of the air, will be under to M. Menotti. It will, doubtless, be decided in common with us, that when time shall have added its sanction to the hopes which the process of M. Menotti allows us to conceive, no one will be more worthy than him of participating in the beautiful bequest of M. Montyon to those who are so happy as to alleviate in their fellow-creatures some of the human miseries.

We have the honour of proposing to the Academy that it grant its approbation to the waterproof soap of M. Menotti.

The conclusions of this report were adopted.

* *Comptes Rendus*, No. 7, Feb. 17, 1840.

PHYSICO-CHEMICAL INVESTIGATIONS CONCERNING DYEING.†

BY M. CHEVREUL.

The investigations of M. Chevreul in dyeing are composed of three series:—

The first comprises all that relates to the *principle* of the simultaneous contrast of colours.

The second, that which relates to the *principle of their mixture.*

† *Comptes Rendus*, No. 4. Jan. 27, 1840.

The third contains *researches essentially chemical.*

The Memoir, of which the following is an abridgment, belongs to the second series: in it the author considers, in an abstract point of view, the *principle of the mixture of colours*, and its application.

I. OF THE PRINCIPLE OF THE MIXTURE OF COLOURS IN AN ABSTRACT POINT OF VIEW.

The principle of the combination of colours, long admitted by dyers and painters, consists in this; 1st. If red, yellow, or blue colouring matters be mixed two and two, orange, violet, and blue are obtained; 2nd. If all three be mixed in proper proportions, black is obtained.

The following example shows that this principle is contrary to that of the simultaneous contrast of colours. Indeed, when there is a mixture of a yellow and a blue matter which appears green, the eye distinguishes neither the yellow nor the blue; it receives the impression of green, resulting from the yellow and the blue. If there is seen, on the contrary, a yellow zone contiguous to a blue one, the two colours, instead of approaching by becoming green, will seem to be removed, since the yellow will appear orange and the blue violet, or, what is the same thing, the yellow will lose from the blue, and the blue from the yellow.*

II. OF THE APPLICATION OF THE PRINCIPLE OF THE MIXTURE OF COLOURS.

It is the application of the principle of mixture of colours to dyeing, to the bleaching of stuffs, &c. &c., to the arts of the upholsterer, to printing upon stuffs, paper, &c. &c., that M. Chevreul has proposed especially to develope in this part of his Memoir: he makes this application;

1st. To the formation of black;

2nd. To what is called in dyeing browning (*brunitare*), or "*rabat.*"

3rd. To bleaching.

I. *Application of the principle of the mixture of colours to the formation of black.*

M. Chevreul,—without occupying himself with the question of knowing if all the blacks produced in the arts may be represented by a union of particles reflecting red, yellow, and blue, or two complementary colouring matters,—sets out with the fact *that matters of complementary colours, mixed in proper proportion, make black, if they reflect only very little white light, or if they reflect, in a sensible manner, normal grey, that is to say, a grey which is neither red, blue, yellow, orange, violet, nor green.*

Conformably to this principle, and by means of the *chromatico-hemispherical construction*, invented by the author, it is always easy to know the colour which must be added to a given colour to produce black, whether in dyeing, or in any art whatever in which bodies are mixed which are without mutual chemical action, or, which, if they exert any, it would be incapable of changing their respective colours

2. *Application of the mixture of colours to the formation of browning* (bruniture.)

When three matters presenting the three simple colours are mixed, red, yellow, and blue, or two matters of mutually complementary colours in different proportions from those in which neutralisation is possible, the result of the mixture is black, rather than the simple colour or dominant binary.

M. Chevreul has shown that this principle is as applicable to the arts of upholstery as to dyeing.

It is particularly when it is wished to prepare a dye of solid faded (*rabattues*) colours, that the application of the foregoing principle is found useful, since it may generally be said that the stability of the products to which it gives rise is equal to that of coloured matters which have been mixed; consequently, when these matters belong to colours of high tint, the faded colours are more stable than those which are so by the process generally adopted, which consists in tarnishing free colours with a kind of ink called "*rabat.*"

3. *Application of the principle of the mixture of colours to bleaching.*

M. Chevreul shows by experiment that a light colour which may have a white body, a stuff, for example, may be neutralised by adding, in proper proportion, a matter of the complementary matter of that which it is desired to remove.

Thus when linen, silk, and wool have an orange tint, it may be neutralised by blue; when they have a yellow tint, it may be neutralised by violet, or red and blue; indeed, is the tint an orange yellow?—it requires a violet blue like ultramarine.

But is a yellow stuff, to which has been added red and blue, or violet, and which appears whiter than before the addition of these colours, identical in aspect with the same species which does not contain any coloured particle? No, it is sufficient to look at it upon a ground as white as snow to discover a normal grey tint, so that it is, relatively to a perfectly white sample of the same stuff, what a second perfectly white sample would be, if seen in a light shade when the other was seen in a direct diffused light; thus, *in dyeing as in bleaching, to neutralise a colour by a complementary colour, is to pass the stuff from a coloured shade to a shade of normal grey.*

MM. Tresca and Eboli have applied the

* See M. Chevreul's work, *De la loi du contraste simultané et de l'assortiment des objets colorés, &c.*

principle of the neutralisation of colours to the manufacture of the stearic taper, and their results are identical with those which M. Chevreul has obtained in dyeing and in tapestry.

Indeed, a pupil of M. Chevreul, M. Chamblant, director of a glass-house, has also produced colourless glass by melting vitrifiable matters, which separately would have given two glasses of mutually complementary colours.

Conclusions.

1st. When a proper proportion of suitably powdered coloured bodies is mixed, whether of tinctorial matters, or coloured powders employed in painting, or, indeed, threads fit for tapestry, the result of the mixture is black, if it reflects little or no white light; if it reflects a notable quantity, it is normal grey.

2nd. This principle and the observation that two light complementary shades are more perceptible as coloured lights than the very pale grey to which their mixture gives rise, explains the result obtained by every process where a light tint of a white object is destroyed by the addition of a coloured matter; so that, as M. Chevreul has said, the process of making black by complementary colours, and that of increasing the whiteness of a slightly coloured surface by the addition of a colour, flow from the same principle.

The generality of the result at which M. Chevreul has arrived will appear still greater, if we call to mind that by means of the same principle he has destroyed an effect of contrast which has some inconvenience when it is desired that drawings should appear colourless, that is to say, white, or of a normal grey on coloured grounds; instead of appearing of the same colour as these grounds, as at present. It is sufficient to mix with the matter of the drawing a little of the colour of the ground, in order that this complementary colour may be neutralised by the colour added. Then the result produces the effect of normal grey, as though the complementary colour really resided in a matter allied to white matter. The same addition may be made to the matter of black drawings upon coloured grounds.

ON THE MANUFACTURE OF FLINT-GLASS AND CROWN-GLASS.*

BY M. BONTEMPS.

M. Bontemps announced, eleven years ago, that according to the indications of M. Guinand, jun., he had been enabled to make flint-glass equal in purity to that made by M. Guinand, sen., and he exhibited several discs, among which was one of 33 centimetres, of which M. Lerebours made an excellent telescope, and another of 38 centimetres, the greatest dimension which had then been obtained. But these discs, although free from streaks, were not without fault; they contained, like those of M. Guinand, numerous bubbles, which occasion a slight diminution of light; besides, he had not yet manufactured crown-glass; he had therefore but imperfectly resolved the problem of the manufacture of optical glass. M. Bontemps now announces that he has at length been enabled to manufacture flint and crown-glass free from streak and bubbles, and perfectly white, and that the loss of the secret of a product of such scientific importance may not be hazarded, he is about to make known the process and all the details which ensure its success.

M. Bontemps begins by giving the history of the experiments made by men of science and manufacturers, since the discovery of achromatic telescopes by John Dollond. M. Guinand, although a stranger to science and the art of glass-making, is the first who has made flint-glass free from striæ. He was acquainted with that process of glass-making which consists in stirring the glass with an iron bar, to make the waves resulting from a bad mixture disappear; and he thought that if the stirring were continued longer, not only the waves but the streaks would be destroyed; and as it cannot be stirred long with an iron instrument which is heated and oxidized, he conceived the ingenious idea of making a cylinder of a refractory earth, that is to say of the same matter as the crucible, closed at the bottom, and open at the top to receive an iron bar hooked at one end, with which he moves the cylinder in the glass; being able in this manner to substitute several bars of iron as they become heated, he was able to stir as long as he pleased, and destroyed the streaks. But M. Guinand had left in uncertainty several elements of the problem, and had not occupied himself in the manufacture of crown-glass, a manufacture which offers many difficulties of another nature, especially those which result from the propensity which silico-alkaline glasses have to devitrify by slow cooling in large quantity.

Among the difficulties which are met with in the manufacture of flint as well as crown-glass, that of obtaining these two glasses free from bubbles is not among the least, and M. Bontemps had not completely surmounted it in 1828. After numerous experiments directed principally to a peculiar mode of stirring, he at length discovered that the absence of bubbles resulted from good proportions in the composition, and especially from certain precautions in the

* *Comptes Rendus*, No. 4, Jan. 27, 1840.

management of the fire towards the end of the operation.

To avoid streaks and bubbles in the manufacture of flint-glass is not all; it is also important to have the greatest transparency; for even a slight colour causes a loss of light. For astronomical telescopes, and especially for the Daguerréotype, an object glass of the finest quality is required. Flint-glass at the density of 3·1 to 3·2 is always very white; but opticians do not find this density sufficient. A greater density facilitates achromatism and permits a shorter focus. Now, as soon as the density is augmented by a greater proportion of oxide of lead, flint-glass frequently acquires a very prejudicial yellowish tint. M. Bontemps thinks, therefore, that he has obtained an important result in producing flint-glass of the density 3·6, whiter than any of those which have hitherto been produced, and as white, in a word, as the finest crystal, and crown-glass as white as the most beautiful glass of Saint-Gobain or Saint-Quirin.

M. Bontemps joined to his memoir the plans of the furnaces and crucibles, and pointed out the method to be pursued to obtain flint and crown-glass; he announces that he means to construct lunettes of superior dimensions to any that have hitherto been made; he will supply opticians with discs of flint and crown-glass of 40, 50, and even 60 centimetres in diameter.

WRITINGS ON PARCHMENT.—FALSIFICATION.—REPORT ON THAT SUBJECT.*

I, Jean Baptiste Chevallier, chemist, Member of the Royal Academy of Medicine, Professor in the School of Pharmacy, commissioned by an order of the 15th of March, 1838, *to examine if writing on erasures, and alterations, exist in the Diploma of Bachelor in Letters, bearing the name of G ...., and if it has been bonâ fide delivered to M. G...., who was the bearer of it.*

In order to obey the aforesaid order, I repaired, on the 4th of May, to the cabinet of the Judge of Instruction; and there, after taking the oath to perform well and faithfully the commission intrusted to me, he put that diploma into my hands, in order to my making the experiments necessary to enable me to answer the question.

Physical Examination of the Diploma.

The physical examination which I made of that diploma shewed me, 1. That it was soiled and *shrivelled* in most of the parts on which different designations are written, such as the name, the christian name, the place of birth; 2. That this shrinking, *this shrivelling of the parchment*, seems to indicate that this diploma was washed, and that being placed in circumstances not foreseen by the person who washed it, nothing had been done to obviate the shrinking of the parchment; 3. That the writing of the names, Christian names, place of birth, is not the same as that of the writer of the first line, *Marthe Camille, &c.*; 4. That in different parts of the diploma, and particularly under the words G...., 11th line; G...., 7th line, *département de l'Ardèche*, 9, *Novembre*, 1813, there are *transparent places* or *marblings* which seem to indicate that the surface was scraped, which has thinned the parchment; 5. That under the word *Aix*, line 7th, there are traces of old writing. All these observations seem at first view to indicate that the diploma which I have examined has been washed with the view of substituting other particulars for the writing removed.

CHEMICAL EXAMINATION OF THE DIPLOMA.

This diploma has been washed with distilled water in the parts which were shrunk and shrivelled. The liquid obtained from this washing, being divided into three parts, was examined by the nitrate of silver, by ammonia, by muriate of baryta, by nitric acid, by evaporation and the employment of chloride of platinum; and it was discovered that the liquid contained chlorine or chlorides, sulphuric acid and potassa. Chlorine or chlorides and sulphuric acid are products employed to remove writing; and potassa to saturate the acids employed, or else as forming a constituent part of the chloride of potassium.

These operations being terminated, and the wetted parts of the diploma dried, those parts were then submitted to the solution of gall-nuts spread by means of a pencil. The employment of this solution, repeated several days successively, made to re-appear; 1. Under the word *Aix*, letters which go beyond that word; but as these letters are masked, it has not hitherto been possible to decipher them; 2. Between the words *Gaspard* and *Albert*, line 7th, the letters *re*, which would seem to indicate that one of the Christian names originally in the diploma was terminated by those two letters; 3. Between the letters *rt*, of the word *Albert*, the letter *e* has re-appeared.

From this I draw the conclusion:

1. That the diploma submitted to my examination has been washed with chlorine or chlorides in order to remove writings which existed there before.

2. That this diploma received, in the parts containing the names, Christian names, the place of birth, other writings

* *Journal de Chimie Médicale*, February. 1840.

than those which had been put there originally.

3. That some parts of that diploma appear to have been altered by scraping.

In here pointing out the letters of the old writing which have re-appeared, it must be observed that possibly after some time other letters belonging to the original particulars of the diploma may re-appear, a fact which has already been observed.

PROCESS FOR OBTAINING PHOTOGENIC IMAGES ON PAPER.*

BY M. BAYARD.

I had deferred until now making public my photographic process, wishing previously to render it as perfect as possible; but as I cannot prevent something transpiring, which might, profiting more or less by my labour, deprive me of the honour of the discovery, I do not think I ought to delay any longer to make known the method which I have found successful.

There is no time for me to enter into the necessary details, but if the Academy will allow me, I will complete the remarks in the next sitting. The following is a brief sketch of my process:—Ordinary letter paper having been prepared according to Mr. Talbot, and blackened by light, I steep it for some seconds in a solution of iodide of potassium; then laying it upon a slate, I place it in the bottom of a camera obscura. When the drawing is formed, I wash this paper in a solution of hyposulphite of soda, and then in pure warm water, and dry it in the dark.

PROCESS FOR OBTAINING PHOTOGENIC DESIGNS ON PAPER.†

BY M. VERIGNON.

White paper should first be washed with water acidulated by hydrochloric acid, then, after desiccation, steeped in a solution composed as follows:—

Water 14 parts, with 1 part of a compound formed of 2 parts of muriate of ammonia, 2 parts of bromide of sodium, and 1 of chloride of strontium.

The paper, dried again, is passed into a very weak solution of nitrate of silver. There is thus formed, by double decomposition, a chloride and bromide of silver, which is made to turn black by exposing the paper to the light for about half an hour. Paper thus prepared may remain sensible during a fortnight, but at the end of that time the black has penetrated to the other side of the paper, which has then lost its sensibility.

To obtain the photogenic effect, it is sufficient to steep the paper in a very weak solution of iodide of sodium, and to carry it immediately, and quite wet, into the camera obscura, placing it in such a manner as to receive the luminous image; at the end of twelve minutes, if the weather is favourable, the photographic effect is entirely produced. We will observe, that when the blackened paper is steeped in the solution of iodide of sodium, it must be placed in a dark or very ill lighted place. The image obtained on the paper requires no more to fix the drawing, than to be passed into a solution of hyposulphite of soda and iron, then to be washed in pure water; the operation is then terminated.

In respect to the theory of this operation, it may first be remarked, that the addition of the alkaline bromide is with the view of forming a more sensible paper than with the chloride alone; a fluoride would have the same result; the preparation would be even too sensible. Again, it will be remarked, that light acts in the operation in three very distinct manners, and at three times: first, it makes the chloride of silver, which is white by itself, pass to the state of subchloride, which is black; then, in the second place, in the camera obscura, it determines the decomposition of the black subchloride by the alkaline bromide, but only in the points where the light arrives in the form of an image, and proportionally to the intensity of the action of its rays; indeed, it acts more or less powerfully on the iodide of silver, as on the plates of M. Daguerre.

PHOTOGENIC IMAGES OF MICROSCOPIC OBJECTS.*

BY M. DONNÉ.

M. Donné presented several of these drawings, obtained with the ordinary compound microscope, and exhibited to the Academy the little apparatus of which he availed himself to produce them.

After having removed the eye-glass of the microscope, I receive the image of the object on a small transparent screen which serves me to find the focus: I then substitute for the screen on iodized plate, and when the light has produced its impression on this plate, I expose it in the usual way to the vapour of mercury.

I have only succeeded in these experiments by receiving the direct solar light on the reflecting mirror; the flame of a good

* *Comptes Rendus*, No. 8, Feb. 24, 1840.

† *Comptes Rendus*, No. 8, Feb. 24, 1840.

* *Comptes Rendus*, No. 8, Feb. 24, 1840.

Argand lamp produced nothing in the space of two hours and a half.

The microscope-daguerréotype which I present, of which I owe the first idea to M. Doyere, is now regularly made by M. Soleil, after the model which I have given to that skilful optician.

ON PHOTOGRAPHY.*

M. Arago communicated to the Academy of Sciences at its sitting of the 23rd December, in the name of M. Daguerre, a new modification introduced by that eminent scientific man, in one of the times of the preparatory operation which the plates are to undergo, in order to be fit to preserve the images which come to be reflected on them. The object in view is the application of iodine, which is to be made, as already known, equally on the whole surface of the plate, and to determine on it, in order to fulfil the object, a fine gold colour. In the first preparations to perform that operation, use was made of a capsule, in which the iodine was deposited; and, as the surface of this focus of evaporation was limited, it was necessary to wait a considerable time to obtain the result sought for. M. Daguerre, to remedy this inconvenience, which prolonged so much the duration of the operation, thought of substituting for the capsule a piece of pasteboard, with the iodine spread on it. This pasteboard is placed in a box, and may be prepared beforehand. Into the same box is put the plate, which is to be coated with iodine, and two minutes are sufficient to prepare it properly. Further, it is always necessary, in order that the vapour should be evenly spread, to put the small borders which were applied in the old process.

M. Daguerre hopes that he is in the way of discovering an almost similar modification, which would also much abridge the time during which the plate is exposed to the vapour of the mercury.

* *Journal de Chimie Médicale*, February, 1840.

FRAUD AS TO COTTON GOODS.

Among the numerous and reprehensible frauds and adulterations which now-a-days are practised by tradesmen and manufacturers, in almost every article of food or commerce, we must mention one which, as often falling most heavily on the poor, is the more scandalous, and deserving of exposure.

It has been represented to us, that many of the cotton goods manufactured at Manchester and other places, are made to weigh heavy by means of a compound of a finely ground carbonate of baryta, mixed up with some feculent substances, which gives the goods a great increase of weight, and makes them appear of a very firm and close texture. A case of this kind lately occurred, which it may be worth while to state.

Some goods thus fraudulently treated were consigned to a merchant at Constantinople, who, in the course of his dealing, had supplied some to the Grand Vizier. It happened that this chief was one day walking, clothed in a dress made of these goods, when suddenly there came on a heavy shower of rain. The consequence was, that the rain soon wetted his garments; the white powder of carbonate of baryta ran down even to his feet, and his dress was then reduced to a flimsy, wet rag, having lost all its stiffness and beauty. The vizier was so exasperated, that he sent men immediately, and had the poor merchant so severely bastinadoed that he was unable to leave his house for a month. The merchant wrote immediately to the manufacturers in Manchester, telling them what we now relate, and entreating them, on no account, to send him any more goods of this kind.

We are quite sure that our readers will agree with us in thinking that, as the poor merchant suffered for the sins of the manufacturers, we are fully justified in thus exposing the practice of the latter.

III. PHARMACY, &c.

VACCINATION REPORT.

PRESENTED TO BOTH HOUSES OF PARLIAMENT BY THE NATIONAL VACCINE ESTABLISHMENT.

To the Right Hon. the Marquis of Normanby, principal Secretary of State for the Home Department.

My Lord,—The experience of another year has confirmed our conviction of the efficiency of vaccination as the best security and protection against small-pox, and has afforded us, moreover, proofs of the propriety, in the present state of our knowledge, of preferring vaccine matter, the produce of the original virus furnished by Dr. Jenner, which has now passed happily through successive generations of subjects in the course of forty-three years, and which forms the principal source of our supply, to any which may have been taken recently from the cow.

We admit that it is sometimes stated to us by our correspondents that the supply which we had sent them has failed, but the same post has generally brought us intelligence that the material supplied from the very same source had succeeded elsewhere, and that it was found efficacious in Somersetshire when it was said to be inefficient in Wiltshire. We have concluded, therefore, either that it has been injured somehow in its transmission, or that the patients submitted to it were not in a fit condition to receive its influence, in consequence of some eruptive disease having preoccupied their constitution, or of some prevailing epidemic disorder having rendered them insusceptible of another and a new excitement for a time.

The number of patients dead of smallpox within the bills of mortality, if we can trust them, has been less this year than any one since vaccination has been practised; and we are justified, by a careful retrospect of several years, in stating that 4,000 lives, on an average, are saved every year, within the district of the bills only, by vaccination having superseded so largely the practice of inoculation.

We have vaccinated, at our several stations, 13,144 persons, and have sent out 165,395 charges of vaccine lymph since our last report to Parliament in 1838.

HENRY HALFORD,
Pres. of the Royal College of Physicians, President of the Board.
ROBERT KEATE,
President of the Royal College of Surgeons.
THOMAS MAYO,
Senior Censor of the Royal College of Phys.
CLEMENT HUE, M.D.,
January 28, 1840. *Registrar.*

FREQUENT AND WEAK INJECTIONS, WITH SULPHATE OF ZINC, IN GONORRHŒA.

This consists, says a correspondent of the *Lancet*, in injecting into the urethra a solution of sulphate of zinc, which should be so weak as to cause but slight pain; the proportion of one grain to an ounce of water has been found most efficient, but should this occasion pain, more water may be added. Before every injection, the patient should discharge urine in order to remove from the canal any morbid matter which may be collected in it. The syringe, which should be covered round the extremity with lint, being filled with the solution, its point must be introduced into the orifice of the urethra, the handle of the piston must be pressed, and the contents injected. That the solution may remain in contact with the diseased surface, the instrument is to be kept in this position for the space of a minute, when it may be withdrawn, and the liquid will be ejected, which terminates the operation.

This application, if properly administered, causes a little smarting in the canal, soon followed by evident relief in passing urine. Any pain caused by the injection may be relieved by injecting with cold water immediately, and water should be added to the solution. It should, however, be strong enough to cause a slight tickling or itching sensation, which will subside almost immediately.

By this means cure has been effected in the severest cases in three or four days, and, in some mild ones, in one day. Its use has never been followed by symptoms of stricture, even in those who have frequently resorted to it; nor by testitis, although from the quickness with which the disease is removed, metastasis might be apprehended. It has been found to cause less inconvenience, and to be more efficacious than many other weak solutions, as those of acetate of lead, alum, and nitrate of silver.

The injection may be performed by the patient.

CREOSOTE IN GONORRHŒA.

Creosote, says Dr. Allnatt, in the *Medical Gazette*, has been found efficacious in some diseases of the cellular and mucous tissues, and also of advantage in scrofulous ulcerations of the throat and limbs, in aphthous affections of the mouth, and in some cutaneous disorders. It has been successfully employed by MM. Reichenbach, Künckel, Lessere, and other Continental physicians, in chancres and other syphilitic sores.

Creosote, being of an oily nature, does not mix with water; and as it is but slightly soluble, the watery solution is not powerful enough in most cases: it has been found, however, very efficacious in some wounds and ulcers.

The following formula, whether as an injection or to be taken internally, has been found highly useful; the alkali gives solubility to the creosote, without injuring its properties.

Injectio creosoti.

℞ Creosoti, Liq. Potassæ; āā. ʒi.
Sacch. alb. ʒij.

Tere simul in mortario; Mist. Camphoræ ʒvj. tum adjice paulatim.

In gonorrhœa in the male, after the acute stage, let a very weak injection be used at first; 10 minims of creosote in ʒvj may be sufficient at the commencement; and, should it be necessary, may be progres-

sively increased to the above-mentioned quantities. If irritation be induced, the proportion of creosote should be lessened.

Creosote might, perhaps, be used with advantage in refractory cases of gleet.

PREPARATION OF MERCURIAL OINTMENT.*

Take two china pans of different sizes; put snow in the larger with a little common salt, to lower the temperature still more. Put above this the other pan containing the mercury with half the grease which it is intended to employ. As soon as this mixture is very cold, stir it until the complete extinction of the mercury, which will speedily take place; for, scarcely does the pan containing that metal feel the contact of the frigorific mixture, and we begin to stir, when we see the mercury become incorporated with the grease as if by enchantment. In half an hour the operation is terminated; then the rest of the lard is added. This process is due to M. Mamone Capria.

FATAL EFFECTS OF THE ACETATE OF LEAD GIVEN IN LARGE DOSES FOR PULMONARY CONSUMPTION.†

BY DR. BICKING, OF MÜLHAUSEN.

Although there is a great number of cases extant in which the acetate of lead has been given successfully, or at least without fatal consequences, for pulmonary consumption, there are others in which fatal consequences ensued from the prolonged use of that medicine: on this subject Dr. Bicking cites the following fact:—

Ferdinand R., aged 15 years, subject to scrophulous diseases during his youth, experienced various symptoms near the organs of the breast, and at length went into a consumption. Having arrived at a very advanced stage of that pulmonary affection, with hectic fever, sweating and colliquative diarrhœa, nothing being able to arrest or amend the progress of the disease, Dr. Bicking tried the exhibition of acetate of lead.

I gave, he says, to the patient a quarter of a grain of acetate of lead, with powdered sugar of milk, four times a-day, for a certain time. Under its influence I obtained a remarkable amendment in the progress of the morbid symptoms; the fever, the sweats, the looseness, and the cough abated. The purulent expectoration also diminished, without the impression increasing. This favourable result induced me to continue the treatment, and for six weeks I increased gradually the dose of the medicine; so that at length the patient daily took two grains of acetate of lead.

At this period the patient experienced a a remarkable improvement, disturbed, however, from time to time, by some recurrence of the general symptoms which had been amended; at each relapse I employed the same means with success. After twelve weeks, all trace of consumption had disappeared, and the child, having returned to school, was no longer under any medical treatment. He had taken, during the course of the disease, almost 130 grains of acetate of lead, without any poisonous, or even injurious effect.

However, he could not be completely re-established; he remained weak, thin, pale, with a frequent pulse, frequent want of breath, pains in the breast, and an obstinate irritating cough. I apprehended lest a new attack of phthisis should carry him off in a few moments. My fears were realized, but in a different manner.

A month afterwards he lost his appetite by degrees; the lower bowels were painfully contracted; the stools were rare and painful; the skin became all over the body of a bluish yellow; the face was swelled and heated; the hair fell off; a convulsive cough soon came on, accompanied by great difficulty of breathing, and by burning pains in the breast, which was succeeded by partial paralysis of the feet. This state lasted fourteen days. One night a violent attack of fever manifested itself, with heaviness of the head, paralysis of one of the eyelids, convulsions of the face and extremities.

All remedies were powerless; the patient was in bed, without consciousness, in an insensible state, or delirious. He died the third day. A *post mortem* examination could not be made.—*C. W. Hufeland's Journal des Pratischen Heilkunde*, March and June, 1839.

The publication of this notice ought not, however, to make it be understood that acetate of lead, employed medically, always has fatal results. We believe that it is necessary to study further the therapeutical action of that acetate; we know that we have found great advantage in that salt in many cases; and we have seen Dr. Bricheteau give pills of acetate of lead to Mademoiselle C.S., who was considered as attacked with phthisis. That treatment was followed by the greatest success; and Mademoiselle C. S. is now married, and has several children, and enjoys perfect health.

* *Gazetta di Chimica Pharmaceutica.*

† *Journal de Chimie Médicale*, Feb. 1840.

POISONING BY ACONITE.*

It is known that *Aconitum Napellus* is a violent poison. Mathiole, Pallas, and other authors have communicated cases of poisoning by that plant, which is found in our gardens as an ornament. The following is a further example of its danger.

At Suippes (Marne), a child twenty-one months old, full of spirits, was taken into a garden by its mother, and stopped beside a plant of *aconitum napellus*, a very poisonous plant, of which the vulgar name is *monk's hood*; he plucked a branch, and took from it some leaves and two or three flowers, which he swallowed. His mother, engaged on the other side, immediately perceived this, and although quite ignorant of the injurious properties of the plant, she took it from him and threw it away. Unhappily it was too late; in half an hour the child began to totter, his face became animated, and he was soon unable to stand. At first, his parents thought that some neighbour had given him wine, and they did not feel much alarm. However, as the symptoms were growing stronger and stronger, and as the little patient complained continually of a pain in the bowels, a physician was sent for, being about two hours after the first manifestation of the pains. He immediately recognized the symptoms of poisoning, and hastened to administer to the child an antidote, some spoonsful of an emetic draught, of which the effect was to provoke vomiting immediately. But this aid had, unfortunately, been too tardy; just as the infant was receiving some spoonsful of the same draught, the physician saw his eyes become convulsed, his jaws lock, the trunk stiffen and curve backwards, and the limbs move convulsively. Five minutes afterwards the child had ceased to live.

POISONING BY ESSENTIAL OIL OF BITTER ALMONDS.

OBSERVED BY M. CHAVASSE.†

M. .... druggist, had put a bottle of essential oil of bitter almonds into a drawer, without a label, beside another bottle not labelled, and containing dulcified spirit of nitre. He was in good health, but from time to time suffered nephritic pains. Having experienced a strong attack of these pains, he ran hurriedly to get the bottle of spirit of nitre, and took a half-oz. draught; but unfortunately he had inadvertently taken the bottle of oil of almonds instead of the other. He immediately perceived his error, and sent for his physician. Half a minute afterwards, he grew pale, fell into syncope, became convulsed, his face assumed the paleness of death, and his pulse was imperceptible.

M. Chavasse arrived without delay; he found the patient on the bed. The syncope had gone away some minutes afterwards, and he had been laid down: he immediately threw up a good deal of food, and bile smelling strongly of prussic acid. Mortal paleness, general cold; pulse at first small, frequent, intermitting, afterwards slow and regular. Subdelirium; the patient stammered incoherently; convulsive movements, chiefly of the eyelids; afterwards the sardonic grin; countenance gay, eyes brilliant, breathing short and panting; attacks of suffocation; convulsive fits. M. Chavasse sent for a stomach pump, but not being able to get one, he made the patient vomit by means of hot water and sulphate of zinc, which he gave to the amount of three drams. At the same time he applied himself to restore heat to the body by bottles of hot water and hot linen; but he did not lose sight of the essential point, after vomiting, the exhibition of stimulants. Accordingly he gave the patient to drink a mixture of brandy and ammonia, diluted with water. The improvement was instantaneous, the pulse, heat, and other functions recovered by degrees, and the patient passed from death to life. The following draught was continued; Ammonia, 1 dram; tincture of cardamom, 1 oz.; camphor mixture, 7 oz. The patient was cured. (*Gazette des Hôpitaux*).

It is desirable that the authorities should pay some attention to the shops of the wholesale perfumers and druggists, who sell by the ounce as a perfume to all makers of pomatum, that *essential oil of bitter almonds*; an oil which is a violent poison on account of the hydrocyanic acid contained in it. We have examined an ounce of it which had just been purchased by a hairdresser, and have convinced ourselves of the fact.

SUSPICION OF POISONING.

REPORT ON THAT SUBJECT.‡

In pursuance of further directions on the subject of D....., we, Jean-Baptiste Chevallier, and Stephen Ossian Henry, chemists, members of the Royal Academy of Medicine, have been charged by an order, made the 11th of February, 1837, by M. Michel-François Dieudouné, Judge of Instruction to the Tribunal of First Instance for the Department of the Seine, to

* *Journal de Chimie Médicale*, Feb. 1840.
† *Journal de Chimie Médicale*, Feb. 1840.

‡ *Journal de Chimie Médicale*, February, 1840.

proceed, on oath, to the chemical examination *of divers coloured papers*, seized at the residence of M. D . . . In consequence, on the 1st of March, we proceeded to the laboratory of one of us, and there, after having taken oath before the Judge of Instruction, to fulfil faithfully the commission intrusted to us, he put into our hands *fifteen bits of paper of different colours*, seized at the former residence occupied by the married couple D . . . . , on occasion of a visit to that domicile, made on the 21st of January, 1837, by M. Lhuillier, Commissary of Police of the Commune of Montrouge, Officer of Judicial Police in aid of the King's Attorney.

These pieces of paper were contained in a sealed sheet of paper, bearing these words:—*Commune of Montrouge (Seine), Commissary of Police;* and ticketed thus: No. 3, *Commissariat of Police of Montrouge, fifteen pieces of paper of different colours, seized at the old residence occupied by the married couple D . . . . (See our report of the 21st January, 1837). Signed, A. Chevallier and Lhuillier.*

The pieces of paper here mentioned were composed,—1. Of two leaves of yellow paper, coloured on both sides; 2. Two leaves of orange-red paper, one spotted in several points, the other having these words in print: (*Grande fabrique de cirage Anglais* (English wax works), *rue de Paris No.* 81, *à Belleville: Beraud, fabricant de cirage;* 3. A very small leaf, with printed characters; 4. Lastly, 10 strips of glazed apple-green paper, and coloured only on one side.

CHEMICAL TRIALS.

First trial.—Yellow paper.

This paper, pretty thick, of a canary-yellow, not glazed, spotted with brown splashes, was divided into several narrow slips, and calcined in a new Hessian crucible, with a certain quantity of alcohol and potassa. The residue, taken up by pure water and filtrated, was of a yellowish colour; its excess of potassa was saturated with acetic acid, and by then adding to the liquid a soluble salt of lead, a yellow precipitate was obtained, which further experiments proved to be *yellow chromate of lead.* The paper was, therefore, coloured by chrome yellow.

Second trial.—Orange-red paper.

A part of this paper, submitted to nitric acid, then a little diluted with water, instantly assumed a brown colour, afterwards that tint disappeared; the liquid acid part, increased by a good deal of water, gave, with sulphate of soda, a white precipitate slow in its formation; with hydro-sulphuric acid it gave a black sediment, &c.; on the whole, all its properties belonged to a compound, with lead for its base. The action obtained by nitric acid, and the orange-red colour of the paper, indicated the presence of minium.

To leave no uncertainty as to the nature of a compound of lead, in the colouring matter of that paper, we calcined briskly a small part in a new china crucible, and the residue was submitted to pure nitric acid; the acid liquid, racked off with the greatest care, furnished, after a slow evaporation, crystals of *nitrate of lead*, the nature of which it was impossible to mistake.

The paper was, therefore, really coloured with *minium* (deutoxide of lead.)

Third trial.—Paper with printed characters.

This little leaf, having some printed marks, of a bluish tint, presented nothing particular. The colour was given by a compound containing indigo.

Fourth trial.—Green paper.

The ten slips of glazed apple-green paper, seized with the preceding fragments, at the former residence of the married couple D . . . . (Rue de Vanvres, Commune of Montrouge), have been examined carefully.

This paper, put into the flame of a candle, burned with a smell of garlic, not intense, indeed, but yet easily recognised.

Being plunged, for about twelve hours, in a diluted solution of pure ammonia, it furnished a sky-blue liquid, which was filtered and evaporated with a mild heat in a glass capsule.

The residue, after this operation, was *deep apple-green*, pulverulent, almost insoluble in water, making no effervescence with the acids, giving out, on lighted charcoal, a very distinct smell of garlic; lastly, being submitted to pure hot nitric acid, it was transformed into a soluble salt, which gave, by means of nitrate of silver, a brick-coloured precipitate of *arseniate of silver*, from which it was easy to isolate the metallic arsenic, by means of reduction with charcoal.

The green colour of that paper was, therefore, given by *arsenite of copper* (Scheele's green), employed frequently for that purpose.

Summary.

The different specimens of coloured paper submitted to our analysis, received their colour, therefore:

1. *From the yellow chromate of lead.*
2. *From minium (deutoxyde of lead.)*
3. *From a compound containing indigo.*
4. *From arsenite of copper (Scheele's green).*

Inferences.

The absence of arsenic, in the results of the analysis of the stomach and bowels of M. D..., does not admit the supposition that the *green-colouring matter*, of the trial of No. 4, could have caused the death of that individual. As to the presence of lead, which metal has been detected in the viscera of D.... after his death, and by means of analysis, it would be difficult to imagine that the papers thus coloured, particularly those coloured by *minium*, had poisoned him, seeing the difficulty of making a person take such substances without knowing it; but it would not be beyond probability, that the lead found in the dead body of M. D...., should have come from the remains of such papers, which might have served for burning, and of which the metallic residue might have been in the ashes, of which a part was introduced into his organs after the autopsy, as has been said in a preceding report.

DR. DEGLAND'S PURGATIVE DECOCTION FOR LEAD COLIC.*

Senna	.	64 grammes	(2 ounces)	
Sulphate of soda		32 do.	1	do.
Syrup of buckthorn		64 do.	2	do.
Water	. .	500 do.	(1 pound)	

Make *secundum artem* a purgative decoction, a glass of which is to be administered to the patient every half hour.

M. Degland, physician to the hospital of the Saviour at Lille, who has charge of the workmen at the factory of Theodore Lefebvre, of Moulins-les-Lillè, has had great success with this decoction.

DRYING THE PETALS OF THE WILD POPPY.†

BY M. HUNOULT DESPONTENELLES.

The petals of wild poppy are ranged on leaves of paper, covering only the halves of the paper leaves, as that the paper may be doubled, and one part cover the petals. This arrangement having been made, the leaves thus charged are placed either on a shovel to put them in an oven, or on a sort of basket, in order that there may be a greater number of leaves; then with a shovel for putting bread into the oven the paper leaves or the basket are placed on the flat bottom of a baker's oven, or of a domestic oven which has just been employed in baking bread; they are left in the oven for a space of time, from one to two minutes, and are then withdrawn. If these petals be examined, it will be seen that the desication is complete. The petals thus dried preserve their colour perfectly, and are not liable to roll up as when they are dried in a stove; moreover they preserve their beautiful colour better.

* *Journal de Chimie Médicale*, Feb. 1840.

† *Journal de Chimie Médicale*, Feb. 1840.

FORMULÆ FOR LOZENGES.

BY MR. BARTLETT.

To the Editor of The Chemist.

SIR,—I herewith send you a few of the formulæ for lozenges, and if approved of, will communicate more.

TROCHUS ANISI.

3 lb. sugar powdered; 3 drams of umber; 50 drops of oil of aniseed, with a sufficient quantity of thick mucilage to form a very stiff mass. This is then to be rolled out to the required thickness, and cut with a tin mould or cutter, allowing them to remain on a tray in a warm place until dry; sometimes they are rolled out in the shape of the Bath pipe.

CAMPHOR LOZENGES.

3 lb. finest powdered lump sugar; ½ dram of Smalt's blue; 1 oz. camphor dissolved in a little spirit of wine, and mixed with mucilage (the whiter the better); and proceed as before directed.

CINNAMON LOZENGES.

4 lb. powdered sugar; 12 grains of drop lake; 2 scruples of gamboge; 60 drops of oil of cassia mixed with mucilage, as before.

BLACK CURRANT LOZENGES.

3 lb. sugar powdered; 3 lb. extract of black currants; 1 oz. tartaric acid; 6 oz. *powdered* gum; mixed, rolled out as before, and cut when *dry*, with a pair of large scissors, into square pieces.

IPECACUANHA LOZENGES.

4 lb. powdered sugar; 1 oz. ipecacuanha powder; 4 drops of otto of roses; mucilage acacia q. s.; ft. *Troches*.

IPECACUANHA WITH TOLU.

The above with ½ oz. tincture of tolu, and 2 oz. of finely powdered cream of tartar.

Fearing you may not have room for more, I wait till next month; but should any of your readers wish for any particular form of lozenge, I shall be happy to give it, if in my power.

Can you or any of your readers inform me if Mr. Warburton is going on with the Medical Bill? I sincerely wish, with you, in your note respecting a letter from Mr. Phillips, of Luton, that there was a school formed in the metropolis for the study of chemistry and pharmacy, for I am grieved at the small amount of chemical knowledge possessed by druggists generally.

Britten Terrace, Chelsea.

LOZENGES OF LACTATE OF IRON.*

M. Bouillaud made a report concerning the lozenges of citrate of iron prepared by MM. Gelin and Conté, apothecaries to La Charité. These young chemists, considering that the ordinary ferruginous preparations are dissolved by the lactic acid which forms part of the gastric juice, and thence carried into the system, have proposed to introduce ready prepared lactate of iron into the digestive passages. M. Bouillaud and M. Fouquier have tried the medicament in question, and their results agree perfectly. From the first 8 days' appetite becomes excessive, and at the end of from 15 to 20 days the symptoms of chlorosis have entirely disappeared.

DESCRIPTION OF AN APPARATUS TO MAKE CAPSULES OF GELATINE.

BY M. HUNOULT DESFONTENELLES.

The swimming bladder of a tench or any other fish is taken. Fishes from five to seven inches long give suitable bladders; it is fixed with fine thread at the end of a copper tube, and the ligature covered with a small pipe; the middle part of the tube contains a little valve opening downwards. Underneath is a little hole closed by a small key. By breathing through the extremity of the tube the bladder is distended, and remains in that state, since the valve, which is closed by the effort of the air breathed in, prevents that air from coming out. A solution of gelatine is prepared similar to that proposed by M. Garot to cover pills with gelatine. (See the *Journal de Chimie Médicale* for March, 1838.) The bladder is impregnated with lard, to prevent the gelatine from adhering to it, and it is plunged in the solution, so that it may be well covered with gelatine. It is withdrawn, the tube is rolled between the fingers, in order that the solution may be spread uniformly over the distended bladder, and it is allowed to cool. When the cooling is complete, the capsule fixed at the bottom of the tube is detached, by making an incision round with a penknife. The hole is opened, the air escapes, and the mould may be easily withdrawn, since being deprived of the air which distended it, it may be folded up. With seven or eight of these moulds a great number of capsules may be prepared, particularly in cold weather.

Instead of the swimming bladder little moulds might be employed made with gold-beaters' skin, or with gauze varnished with caoutchouc. A small clay mould might be made with a quill fitted to it, and afterwards left to dry. The mould might afterwards be covered with the gauze or skin; and this fixed with thread on the quill, and several coats of varnish applied. When the varnish became dry, the clay might be got out by the opening, and the mould afterwards fitted on the apparatus.

The employment of swimming bladders may be made still more simple; we may condense the air by urging the piston into the tube. This condensed air would distend the bladder; when the coat of gelatine was dry, the piston might be withdrawn; the bladder would then become flaccid, and the capsule might be removed.

ON THE PRESERVATION OF SUBJECTS, FOR NORMAL AND PATHOLOGICAL ANATOMY, WITHOUT ALTERING THE COLOUR OR DENSITY OF THE TISSUES.†

BY DR. CH. DUJAT.

Hitherto, no method had been discovered of resisting the putrefaction of animal substances, without changing the appearance of the tissues; the aluminous injections, although they have rendered real services in latter times, spoil the instruments and give to the muscles, vessels, and nerves, an uniform white tint which does not admit of their being easily distinguished; accordingly, the use of them has not become so general as might have been thought.

It is, therefore, an object of interest to know an easy process to prevent putrid decomposition, without at all changing the appearance of the parts. In countries between the tropics, anatomical studies were rendered peculiarly difficult by the rapid putrefaction of dead bodies in all seasons; but since Dr. R. O'Shaughnessey has tried, for dissections, the arsenical injections recommended by Dr. *Tranchina*, of Palermo, to preserve dead bodies, anatomical studies have been pursued in the native medical college at Calcutta, even with more facility than with us.‡

Last winter, and also recently at the practical school of Paris, I have injected several subjects by this process, and the success has been complete; the brain, after several weeks, was as firm as it was found on the

* Royal Academy of Medicine, sitting of the 4th of February, from *L'Experience*, Feb. 6, 1840.

† *Journal de Chimie Médicale*, Feb. 1840.

‡ This Institution, founded of late years for the medical education of Natives, has 100 pupils. The zeal and intelligence of the young Hindoos, and the judicious plan of study, give us reason to expect that it will send forth soundly educated medical practitioners.

autopsy; the pathological alterations of the different organs had retained their usual appearance. An arm, injected with an arsenical solution last March, was kept in a closed place to retard its desiccation; three months afterwards it was in a state of perfect preservation, and might have been still dissected: it has been completely dried since,—the muscles are of a deep red, without any other alteration of colour. On the 11th of last October, I suspended the already advanced putrefaction of a body by the arsenical injection; and I still (26th November) preserve parts which present no other difference from those taken from a subject a few days dead, except the detachment of the epidermis. Pieces in a state of putrefaction, macerated in that liquid, have lost their smell, and have been very well preserved.

The advantage of this process for anatomical preparations, and for desiccators in that department, is easily conceived; since even specimens of pathological anatomy thus retain their primitive appearance until the drying is complete.

This means is also valuable for the preparations of skeletons with the ligaments; it is sufficient to give them several coats, or (which is better) a bath of the hot solution of arsenic, to protect them from insects, and to preserve the bones. As the arsenical injection, if driven with sufficient force, penetrates all the tissues, it also affords, for preserving the skins of stuffed animals, a much more certain means, since the operation will have been performed before the animal has lost all its heat.

I had thought that Dr. R. O'Shaughnessey was the originator of this mode of preserving subjects for anatomical studies by arsenic acid; but I have since learned that Professor Dudley, in the United States, has, for more than fifteen years, injected in this manner the subjects submitted for dissection in the school at Levington. Chaussier himself appears to have employed this process to preserve dead bodies.

The poisonous properties of arsenic might create fear in rendering this mode common; accidents have happened to men who had their hands for several hours bathed, and as it were, macerated in a solution of arsenic. The same circumstances are not met with in dissection; the hands are not wet with the moisture of the dead body, except accidentally, and for a very short time. On the other hand, the arsenious acid, little soluble when cold, is deposited in a great part in the web of the tissues, and the liquid contains very little of it. The fears manifested respecting the use of this process are, therefore, exaggerated. I am even persuaded that it renders the punctures made in dissection less dangerous; the atoms of arsenious acid, which might be absorbed by the denuded points of the skin, can alarm only homœopathists. The disengagement of arseniuretted hydrogen has been feared; but none can be formed, since the putrid decomposition does not take place. Besides, experience, the best criterion in all things, has demonstrated that these fears are ill-founded; since at Paris, Calcutta, and Levington, numerous pupils have dissected subjects without being injured. On the other hand, I have reduced to 125, and even to 64 grammes, the dose of arsenious acid for the injection of a single dead body, instead of a kilogramme, recommended by Dr. Tranchina.

The following is the process which I employ:—

Arsenious acid in powder .	125 grammes.
Common water	1½ kilog.

I boil for five or ten minutes in an earthen or other saucepan, and, with a domestic syringe, *not greasy*, I inject the liquid by the crural or carotid artery, in which an end of a thick probe has been fixed. As the syringe contains but 509 grammes of liquid, it must be filled three times for the solution of 1,500 grammes. This is to be hot; for as I have said above, the arsenious acid is partly deposited on cooling. It is good to drive the injection with a moderate force, particularly in aged subjects, in order to penetrate the bones, ligaments, and other parts, which receive only small vessels. With subjects which are to serve for angiology, the solution is to be allowed, for twenty-four hours, to penetrate the tissues, and so clear the vessels before making the thick injection; this second operation succeeds quite as well as if the first had not taken place. In ordinary dissections, I have sometimes injected only 64 grammes of arsenic in one kilogramme of water; but this quantity of liquid not being sufficient to penetrate all the parts of a large subject, I have seen those parts, which receive few arterial vessels, affected with worms at some points, and becoming putrid, but never the other parts.

When the subject is designed to be preserved indefinitely, the injection is to be repeated with the same dose a second, and even a third time, at some hours' interval, when the first has thoroughly penetrated the tissues. I have reason to believe that a dead body, penetrated with 367 grammes of arsenious acid, will be always protected from putrid decomposition, in whatever place it may be deposited.

The solution of deuto-chloride of mercury is not a sure means of preservation; this salt finally passes into the state of a proto-chloride, and even is restored to the me-

tallic state, and in these two cases no longer possesses the same preservative qualities; whereas, all the combinations of arsenic are opposed to putrefaction.

Lately, a solution of creosote has been recommended; and still more recently, Drs. Babington and Rees (*Guy's Hospital Reports*, No. IX., October, 1839, p. 142,) have recommended pyroxalic spirit. These liquids, it appears, preserve subjects very well; but their offensive smell and high price, prevent the general use of them. Arsenious acid has no smell; and the quantity necessary for a subject does not exceed the price of twenty centimes.

MOXON'S EFFERVESCENT MAGNESIA.

This powder is much extolled in England for weakness of stomach, indigestion, nausea, &c. It is sold at a very high price. M. Durand thinks that it may be very well imitated in the following manner:

Carbonate of Magnesia	1 P.
Sulphate of Magnesia	ää 2.
Bicarbonate of Soda	
Tartrate of potash and of Soda ..	
Tartaric acid	

All these salts are employed free from water of crystallization, pulverized and kept together in a bottle hermetically closed, protected from all moisture. The dose is a spoonful in a glass of water, to be drunk at the moment of effervescence.—*American Journal of Pharmacy.*

Fluid Magnesia.—To form the solution of bicarbonate of magnesia, the following process is to be adopted:—Put one pound of common carbonate of magnesia into a Woulfe's apparatus, say half into each of two bottles; then pour into each about a quart of water; and afterwards pass a stream of carbonic acid gas, made in any cheap manner, into the magnesia, continuing it for some time. The carbonic acid will dissolve the magnesia, which can be poured off clear from any that remains undissolved; and this, with fresh water poured upon it, can be subjected to a second operation with the stream of carbonic acid. The proportion of water is about one ounce to fifteen grains of the bicarbonate of magnesia

PRIZES PROPOSED.*

The Society of Medicine of Bourdeaux puts to the concourse the following questions:—

1st. *To investigate, by chemical analysis, the active principles of the root of the wild pomegranate, and to confirm by clinical facts their therapeutical virtues.*

The prize is 200 francs, to be decreed in 1840.

2nd. *Is varioloïd a new disease?*

Is varioloïd a distinct disease, or a simple modification of variola.

To illustrate these facts by observations.

The prize is 300 francs, to be decreed in 1840.

3rd. *To make known the alterations which distilled waters in general may undergo, particularly those of orange flowers, mint, melissa, and the cherry laurel; to point out the chemical causes of these alterations. Is there a general method of preserving distilled waters? Is there one for some among them?*

The prize is 300 francs, to be decreed in 1841.

4th. *To determine, by clinical facts, anatomico-pathological investigations and chemical analysis, the differential characters of diseases of the osseous system. To say if these diseases have not natural differences more fundamental than those of their form. To deduce from it the therapeutical rationale.*

The prize is 400 francs, to be decreed in 1841.

The memoirs, very legibly written, in Latin or French, should be sent, post free, to M. Burguet, General Secretary to the Society, Rue Fondaudége, No. 41, before the 15th of June of the year in which each prize is to be decreed. The competitors are required not to make themselves known; they must distinguish their memoirs by a sentence which will be repeated in a sealed note containing their names and their addresses, or those of their correspondents. If these conditions are not complied with, their works will be excluded.

* *L'Experience*, Feb. 6, 1840.

TO CORRESPONDENTS.

Nota Bene.—*All Communications must be addressed, "To the Editor of The Chemist, care of Mr. Hastings, Publisher, 13, Carey-street, Lincoln's Inn Fields, London."*

We are greatly indebted to Mr. Muspratt for his communication.

To Mr. Tuff we are much indebted for his suggestions, which shall not be lost sight of.

With Mr. Stuart, the Editor entirely coincides as to advocating the reforms alluded to. A leading article is not usual in a monthly philosophical journal; but our columns are open for reception of well written and powerful articles on the subject of chemical reform, or of medical reform, as affecting chemists.

The Buranhem, or Monesia, may be procured at Messrs. Savory and Moore's, New Bond Street.

STEWART AND MURRAY, PRINTERS, OLD BAILEY.

THE CHEMIST.

I. CHEMISTRY.

ON THE REPRODUCTION OF CHROMIC ACID FROM THE MURIATE OF PROT-OXIDE OF CHROME BY MEANS OF PER-OXIDE OF LEAD.

BY CHARLES WATT.

In some recent operations, I have had occasion to employ large quantities of chromic acid in combination with muriatic acid, a compound which I have formed by decomposing the bichromate of potassa with muriatic acid, or with the chloride of sodium decomposed by sulphuric acid.

As in certain processes of the arts, this compound is employed in contact with vegetable and animal substances, it is almost superfluous to inform chemists that it undergoes complete decomposition, and is converted from chromic acid $\ddot{C}r$ to the green or prot-oxide of chrome $\ddot{C}r^2$, which is held in solution by the muriatic acid, forming a muriate of prot-oxide of chrome.

As, however, the chromic acid is a somewhat expensive substance to be employed in large quantities, it is of great importance to recover it, so that it may be used in repeated operations, or be formed into compounds adapted for useful purposes in commerce and the arts.

I made many attempts to recover it. The common method employed for the formation of chromic acid from the native chromate of iron, of course readily suggested itself; but this was attended with many inconveniences and much expense, besides being very troublesome. I therefore, after numerous trials, adopted the following process.

I found that when the per-oxide of lead was introduced into a solution of the muriate of prot-oxide of chrome, and heat applied, decomposition took place; a beautiful yellow chromate of lead was formed; and the green liquid muriate of prot-oxide of chrome was rendered clear and colourless.

Finding it necessary to form some plan of making the per-oxide of lead in large quantities, I was induced to try first the subjecting the deut-oxide, *i. e.* red lead, to the action of nitric acid, which converts one part of the red lead into per-oxide, and another part into the nitrate of prot-oxide.

This, however, is a rather expensive and troublesome process, as it requires repeated washing; and even when washed repeatedly, I found some evidences of nitric acid remaining; for when the per-oxide was mixed with the green muriate of prot-oxide, and heat was applied, a very pungent gas, affecting violently the eyes and causing distressing cough, was given off. This gas I found to be the chloride of azote.

I therefore formed the per-oxide of lead by passing chlorine gas through the deut-oxide covered with water in a Woulf's apparatus, and found it even to possess advantage over every other method of procuring it.

The next step, in reducing the muriate of prot-oxide of chrome, is to put into it a given quantity of puce or per-oxide of lead, and apply heat by steam or otherwise, when the puce colour of the per-oxide will soon begin to change to a white chloride, and from that gradually to a beautiful yellow chromate of lead, and by continuing the heat, and adding more per-oxide of lead, or if this latter is in excess, more green muriate of prot-oxide* of chrome, the operation will be completed.

By this means, the whole of the muriate of prot-oxide of chrome is converted into the chromate of lead, and this so perfectly, that after being washed repeatedly in hot water, and dried, it is fit for use as a pig-

* It is necessary to remove the supernatant liquor while hot, in order to carry off all muriate of lead, as this is soluble in hot water, but not in cold, and therefore becomes mixed up in the chromate of lead, and, in addition to wasting the chloride of lead, causes the chromate to become rough and gritty.

ment, or for any other purpose to which it is adapted.

The foregoing process I found, after repeated trials, perfectly to answer all the purposes for forming, from the muriate of prot-oxide of chrome, the yellow chromate, or red di-chromate of lead, and thus saving the loss of chromic acid, which in all large operations is of very great importance, as it is very extensively employed in Manchester and other manufacturing districts.

OBSERVATIONS CONCERNING TARTARIC ACID.*

BY M. BERZELIUS.

Frémy has published his experiments on the modifications which tartaric acid undergoes by heat; I mentioned them in my last report, p. 264, wherein I could show only the principal results. Tartaric acid partakes the property, with phosphoric acid, of changing capacity of saturation under the influence of an elevated temperature. We cannot naturally discover by experiments the causes which bring these changes about; we must be content with simple reasoning.

The reasoning which, in my opinion, appears most plausible is this:—in an anhydrous acid the elements are probably grouped in the simplest manner, and in hydrated acid they are so in an apparently different manner. I take the liberty of repeating that which I said in the report of 1837, p. 132. It is more than probable, that the three atoms of oxygen in anhydrous sulphuric acid are grouped together so as to form a triangular diagram, and that the sulphur is placed above, so that the four atoms form between them a regular tetrahedron. On the other hand, it is clear that in hydrated sulphuric acid and the sulphates, the three atoms of oxygen of the sulphuric acid and that of the base form between them a square, while the atom of sulphur is found on one side of this diagram and the atom of the radical of the base on the other, so that the six atoms form together an octohedron. Whether it be really so or not, it is no less evident that the relative position of the atoms cannot be the same in both cases. I have availed myself of this manner of representing this subject only as an example which, were it stripped of all truth, might nevertheless throw some light on the idea which I wish to express, as well as if it were perfectly accurate. In the combination $\dot{H} + 2\ddot{S}$ the relative position of the atoms should again be different; in a word, for every change in the proportions of combination, there should be a change in the relative position of the simple atoms. If we suppose that this latter combination be composed as the formula $\ddot{S} + \ddot{S}\dot{H}$ expresses, the atoms of oxygen in $\ddot{S}$ should change position, if $\dot{H}$ enters into this combination. If the affinity on which depend the modifications of the proportions of the combination be strong, there will immediately take place a change of position, as in sulphuric acid; the change will be effected slowly if this affinity be weak; indeed, if very weak, it often does not occur at all; whence it results that in this case the relative positions of the atoms are maintained with a force greater than that of the affinity. Let us suppose for a moment that sulphuric is a very weak acid, or that we have a very weak acid to which might be applied that which we have just said of the relative position of the atoms of sulphuric acid. Let us designate this weak acid by the formula $\ddot{R}$. It is evident that in the combination $\dot{H} + \ddot{R}$, the atoms of hydrogen may be exchanged with the greatest facility for the atoms of a more powerful basic radical, without deranging the position of the other atoms; we shall thus have $\dot{K}\ddot{R}$, $\dot{F}e\ddot{R}$, &c. &c. The same thing occurs with $\dot{H} + 2\ddot{R}$; we shall then have $\dot{K}\ddot{R}^2$, $\dot{F}e\ddot{R}^2$, &c.; but if an atom of water, potassa, or oxide of iron be introduced into this combination, it will then be necessary that a change in the relative position of the other simple atoms be operated, which requires time. $\dot{K}\ddot{R}^2$ may also be for a long time mixed with $\dot{K}$; $\dot{K}$ may even be separated from it, before the transposition has had time to make considerable progress. But let it act for the required time, the transformation takes place, and $2\dot{K}\ddot{R}$ is obtained from $\dot{K}\ddot{R}^2$.

Let us suppose that $\ddot{R}$ is fixed; by heating $\dot{H}\ddot{R}$ to a certain temperature, the tension of the water becomes stronger than the affinity, and the water escapes, until there remains only $\dot{H}\ddot{R} + \ddot{R}$, wherein the position of the atom is gradually changed according to circumstances; indeed, if even the last half of the water is gone, the atoms will be grouped so as to form $\ddot{R}$. It is probable that, during this operation, chemical combinations are formed and destroyed, *de novo*, such as $\ddot{R} + 3\dot{H}\ddot{R}$, $\ddot{R} + 2\dot{H}\ddot{R}$, $\dot{H}\ddot{R} + \ddot{R} + 2 + 3 + 4 + 6 \ldots\ldots \ddot{R}$, before the water is entirely driven off. If water be now added to $\ddot{R}$, a new arrangement in the grouping of the atoms commences, there are gradually formed small quantities of $\dot{H}\ddot{R}^3$, and at length, when the number of fixed atoms of water

* *Journal de Pharmacie*, February, 1840.

equals that which may be combined with $\ddot{R}$, $\dot{H}\ddot{R}$ is formed. By treating, for example, $\dot{H}\ddot{R}^2$ by potassa, $\dot{K}\ddot{R}^2$ is immediately obtained, so that the derangement occasioned does not extend beyond $\dot{H}\ddot{R}^2$; but to form $\dot{K}\ddot{R}$, there is required, if not as much time as to form $\dot{H}\ddot{R}$, at least a certain space of time. Many authors, basing themselves thereupon, attribute to water a certain specific action, but it is evident that the same phenomenon would occur with every weak oxidized base, liquid and volatile. That which I have just been saying is a brief detail of the phenomena which tartaric acid, exposed to the action of an elevated temperature, presents, and which, probably, are also presented by other non-volatile acids, and with an inferior energy.

When a few grammes of tartaric acid are heated (the experiment is less certain of success when too great a quantity is taken, on account of the difficulty of heating the whole mass equally) to 200° centigr. so as to fuse the acid, and maintained at this temperature for some time, we obtain, before the acid has time to be coloured, a modified tartaric acid, which is deliquescent, whose chemical properties are totally different from those of the ordinary acid, which give, for example, soluble salts with lime and baryta. If the acid is dissolved in water, and rapidly saturated with carbonate of lime or baryta, the unmodified acid gives precipitates with these earths, and the liquor retains the soluble salts, which may be obtained by treating it with alcohol, which separates them; nothing then remains but to dry them in vacuo. The isolated acid may be obtained by treating the solution of the salt of baryta with sulphuric acid, filtering rapidly and evaporating in vacuo. It is requisite to operate with rapidity, in order that the tartaric acid may not resume its ordinary form.

Frémy calls this new acid *tartralic* acid. The ordinary acid yields it by losing one-fourth of its water, whence results $4C_4H_4O_5 + 3H$, wherein three atoms of water may be changed for bases. This acid does not crystallize, but it forms a viscous and thick syrup. In this condition it may be preserved; but, dissolved in water, it returns in the course of twenty-four hours to the state of the ordinary acid, and more rapidly by the aid of heat. It is soluble in alcohol, but its salts are insoluble in it. The alkalies effect its conversion into the ordinary acid quicker than water. With oxide of lead, it yields a rather soluble salt, which may be obtained by pouring, drop by drop, a solution of the recently prepared acid into a solution of nitrate or acetate of lead, and washing rapidly. If the washing be prolonged for twelve hours, there is obtained on the filter nothing but ordinary tartrate of lead. Frémy has analyzed the hydrated acid and that of the salt of lead; he has also determined the quantity of base contained in the salts of lime and baryta, deprived of their water of crystallization. All these analyses agree with the formula $3\dot{R} + 4C_4H_4O_5$; the salt of lead is anhydrous, and the earthy salts contain three atoms of water of crystallization. Frémy considers the acid as a double one, and the salts also as double, composed, in his opinion, according to the formulæ $3\dot{H}C_4H_4O_5 + C_4H_4O_5$, or $2\dot{H}\dddot{T} + \dot{H}\dddot{T}_2$ and $3\dot{R}C_4H_4O_5 + C_4H_4O_5$ or $2\dot{R}\dddot{T} + \dot{R}\dddot{T}^2$.

If the acid of which we speak be kept at + 180° after it is melted, and it retains its fluidity, it loses a fresh portion of water, and produces $\dot{H} + 2C_4H_4O_5$; Frémy distinguishes this last by the name of *tartrelic* acid; it is the same as that which is expressed by the latter terms in the formulæ which we have just given for tartralic acid. This acid is deliquescent, but to a slighter degree than the preceding; it has a little colour, which, however, seems to be a consequence of the prolonged action of heat; it does not crystallize, and dissolves readily in alcohol. When the aqueous solution is saturated with carbonate of lime or baryta, the soluble salt which is formed may be obtained in a syrupy state by the addition of alcohol. Frémy has analyzed the salts of lime, baryta, and lead; their formula is $\dot{R} + 2C_4H_4O_5$. When this acid and its salts are digested in water, they return to their preceding states, and from these to that of tartaric acid or tartrates; but the latter remain in the state of bisalts. Instead of the names which Frémy has given to these acids, it would have been more simple to distinguish them by the letters, *a*, *b*, and *c*, as is the case with the phosphoric acids, for they are evidently not different acids, but the same acid, under different modifications, and it may be that these are the same salts chemically combined with a variable number of atoms of anhydrous acid. Frémy adds that, when the operation is interrupted before all the acid is rendered anhydrous, if it is rapidly dissolved in water and precipitated by acetate of lead, the precipitate obtained contains much more acid than enters into the composition of the tartrelates. There is formed, therefore, that which we have expressed by $\dot{H}\ddot{R} + 2\ddot{R}$, $\dot{H}\ddot{R} + 3\ddot{R}$, &c., in the theoretical examples explained above.

ANHYDROUS TARTARIC ACID.

The above acid having commenced at 180°

continues to lose water until it becomes anhydrous acid of a dark colour. However, a colourless acid may be obtained by heating 15 or 20 grammes of powdered tartaric acid in a porcelain capsule over burning coals. The mass commences by fusing; it speedily attains the above-mentioned modifications, and is reduced, in about five minutes, to a white porous mass, which is anhydrous tartaric acid. This modification of tartaric acid was discovered by Braconnot several years ago. The acid is removed from the capsule, and exposed for some time to a temperature of 150°, in an oil bath. If this last operation is neglected, the acid is gelatinized with water, and is washed with difficulty; while subjecting it to it, it is not attacked suddenly by water, and contains but little tartralic acid. When the washing water no longer reddens turnsole paper, it is pressed in blotting paper, and dried rapidly in vacuo.

It is perfectly pure, has a faintly acidulated taste, is insoluble in water, alcohol and ether. By digesting it in water, it passes successively through all the intermediate states, and is at length converted into ordinary tartaric acid. Alkalies and heat hasten this conversion. By means of sulphuric acid, the two modifications may be produced without the employment of heat: Frémy has not obtained the anhydrous acid by sulphuric acid. He found that paratartaric acid gave in all respects the same modifications as tartaric acid, only it requires a rather higher temperature. The acids which are obtained and their salts have a composition completely analogous to those of tartaric acid; what we have said of the one is consequently applicable to the other; however, the acids are not the same as those of tartaric acid, but are modifications of paratartaric acid, which is reproduced from them by the action of water. This contradicts, therefore, what has been said in a former report, namely, that fused paratartaric acid is converted into tartaric acid by being dissolved in water.

Acknowledgment is due to the author of this valuable work, which has been executed with the greatest care, and the results of which are explained with a clearness which allows theoretical views to be drawn from them concerning chemical combinations which at first sight appear to be so anomalous.

CONTRIBUTION TO THE HISTORY OF THE FORMATION OF EMETIC.*

BY FR. KNAPP.

The formation of emetic by boiling oxide of antimony and cream of tartar in water, according to the known process, requires an explanation, which it has not had until now, while the second product, which is formed at the same time, has not been studied. There is found, indeed, in the supernatant liquor of the crystals of emetic, a salt resembling gum, extremely soluble, and of unknown composition: without knowledge of this composition, it is impossible to give an account of the phenomena of the production of emetic in all their relations.

M. Berzelius mentions this salt (*Traité de Chimie*, vol. v. p. 709), with the observation, "that it contains more oxide of antimony, in proportion to the potassa and the tartaric acid, than the crystallized portion," and that the formation, as well as the cause and circumstances which determine the proportion in which it is found, are yet obscure.

M. Liebig, in his *Dictionnaire*, page 430, says that the salt of the supernatant liquor of emetic is probably only the neutral salt corresponding to emetic,

$$= \overline{T}\,Ko + \overline{T}^{2}\,Sb^{2}\,O^{3}.$$

The following investigations support this last opinion.

The emetic, whose supernatant liquor was examined, had been prepared with pure oxide of antimony, obtained by dissolving antimony in sulphuric acid, and decomposing the salt thus formed by water and carbonate of potassa. After several evaporations of the supernatant liquor, no more emetic crystallizes, and we have, after the complete dissipation of the water, ½ or ¼ of an amorphous salt, transparent, of a brown colour, very much resembling varnish in aspect, when in very fine layers, and gum arabic, when in larger fragments. The aqueous solution presents a powerfully acid reaction. It is very difficult to obtain this body in the dry state, on account of its great affinity for water.

If a solution of this salt be mixed with alcohol, an abundant white granular precipitate is formed; alcohol deprives the liquor of colour and reaction. When dried, the precipitate forms a white powder, much less soluble than the gummy salt, which is easily obtained crystallized in very clear octohedra, which is formed of oxide of antimony, potassa and tartaric acid, and is no other than emetic.

The alcohol does not contain either oxide of antimony or potassa; it gives, by evaporation, tartaric acid only.

The salt of the supernatant liquor is, therefore, emetic with more tartaric acid than ordinary. Indeed, if a solution of this acid be boiled with emetic, a much greater quantity is dissolved than the volume of the liquid allows of, and by allowing the

* *Annalen der Pharmacie.*

excess of emetic to crystallize and evaporate, a gummy colourless salt is obtained, similar to the preceding, with this difference, that it crystallizes very easily, while the former does not crystallize at all, or at all events not for some months, on account of accidental impurities. The colourless crystals, deposited from a solution evaporated to a syrupy consistence, and slowly cooled, present axes inclined towards one another by oblique angles, and belong consequently to forms of a crystalline system different to that of emetic. Slowly heated in a narrow glass tube, they disengage water, become perfectly white, and are then fused into a transparent varnish. Exposed for some time to the air, they lose their transparency and begin to effloresce, but not until the end of three or four hours.

When very dry, and yet transparent, they lose in mean, in rarefied air, 9·225 per cent. of water of crystallization. Deprived of this water, they gave by analysis :—

$4\dot{T}$ =	3322·828 —	54·916
$2\ H^3\ O$ =	224·958 —	3·718
$K\ O$ =	589·916 —	9·750
$Sb^3\ O^5$ =	1912·904 —	31·615
	6050·606 =	99·999

The formula of the combination in question is, therefore,

$$3\ \dot{T},\ Sb^3\ O^5 + \dot{T}\ Ko + 2\ aq.$$

The crystals contain five atoms of water of crystallization, which are equal to 9·29 per cent. instead of 9·225, the mean number found. Their atomic weight is, therefore, 6613·01.

The author afterwards examined some anomalies presented by different supernatant liquors of emetic, and put it beyond doubt that they owe their production to the formation of double salts arising from the tartrates contained in them.

He concludes by saying that the gummy salt may be easily transformed into emetic (neutral emetic, which is always obtained by preparing emetic with pure matters). It is sufficient to boil this salt with oxide of antimony, until it dissolves no more of it. We thus obtain emetic and fresh supernatant liquors, which, saturated by carbonate of potassa, yield a fresh quantity of emetic without any ulterior residue.

REPORT CONCERNING M. BOUTIGNY'S MEMOIR, ENTITLED, "PHENOMENA OF CALEFACTION." *

BY MM. ARAGO, PELOUZE AND ROBIQUET.

There is no one but has had an opportunity of remarking the singular effect which water experiences, when it is poured, drop by drop, on a very hot metallic plate; however, this phenomenon, which is so common, has not yet received any very satisfactory explanation. It may even be added, that until latterly it has attracted the attention of but few philosophers. Eller appears to be the first who has paid attention to it, † but he confined himself to observing and describing it. Leindenfrost, in a treatise entitled "*De aquæ communis qualitatibus*," printed at Duisburg in 1756, says that he had observed that a drop of water poured into an iron spoon heated to redness, is a long time evaporating, and that it forms a globule which turns about, or remains immovable and transparent, like a little crystal sphere. In 1802 ‡ this experiment was repeated by Klaproth: he did it comparatively in capsules of iron, platinum, and silver, and he ascertained that at red heat the length of time occupied by evaporation was not the same in these different metals. Rumford, in order to try and discover the cause of this phenomenon, held the interior of a silver spoon over a candle, for the purpose of covering it with lamp-back, and then poured into it a drop of water, which at the ordinary temperature was formed into a globule, not being able to wet the moistened surface: he could then heat the spoon until he could no longer hold it by the handle, without the drop of water being perceptibly heated. Rumford thought he might conclude from this result that the drop of water reflected the heat, and prevented it from penetrating into its interior. We find, in a memoir read to the Academy in 1825, by our learned brother M. Pouillet, § the detail of many experiments undertaken with a view to recognize the electricity which is developed in chemical actions, and he relates that he succeeded in half filling with water a large platinum crucible maintained at a white heat, and that he had kept the water in it for a quarter of an hour, without its undergoing any motion or perceptible diminution. This skilful philosopher having remarked that water blackened with ink or fine charcoal powder, evaporated, on the contrary, very quickly, supposed that the phenomenon was probably owing to the facility with which the radiating caloric emanating from very hot bodies, traverses different media; it might indeed be, adds M. Pouillet, that the caloric carried away by the sides of the heated crucible, tra-

* *Comptes Rendus*, No. 10, March 9, 1840.

† *Histoire de l'Academie de Berlin*, 1746, p. 42.

‡ *Journal de Physique*, 1802, p. 62; and *Nicholson*, vol. iv. p. 202.

§ *Annales de Chimie et de Physique*, t. xxxvi. p. 5.

versed the water without being absorbed, and consequently, without heating it as much as less hot rays would have done.

M. Le Chevallier* has since observed, like M. Pouillet, that in letting water fall, drop by drop, into a red hot platinum crucible, it may be filled and kept a long time in this state without any considerable evaporation; but if the crucible were raised from the fire, the water, from the time that the crucible became below a dull red heat, entered into full ebullition, and was rapidly converted into steam. M. Le Chevallier has seen, moreover, that after having put water into an incandescent metallic vessel, and having closed it accurately with a stopper of the same metal, then opening it after a certain time, that the tension of the vapour had not augmented, and that consequently the temperature of the liquid had not risen, although for some time there had been no loss of steam.

Perkins also remarked that if, after having made a small aperture in a generator, this generator was heated, there was at first a trifling escape of steam, which ceased as soon as the vessel reached red heat.

M. Baudrimont undertook, in 1836,† a series of experiments to demonstrate the inaccuracy of the opinions before him, and he established that all the phenomena observed by M. Le Chevallier might be more easily explained by the evaporation of the liquid. According to M. Baudrimont, the quantity of vapours produced ought to swell up the liquid if it were formed quickly enough to prevent it adhering to the vessel; this liquid can then be heated only by radiation, but is constantly generating steam, which raises its heat by contact, whence it follows that the heat of the liquid cannot be raised much, and that ebullition is almost impossible; for, that it might take place, the liquid must adhere to the side of the vessel which contains it, in order that the steam, being supported by it, might conquer the cohesion of the liquid rather than its adherence to the vessel.

M. Laurent made, in his turn, some experiments which led to still different conclusions. He found at first that a volume of water is volatilized five times quicker in a crucible moistened and cooled, that in a red hot one.

It was generally admitted that water, in these experiments, did not touch the sides of the crucible, and that it was supported by a bed of steam, whence it had been concluded that its ebullition was impossible. M. Laurent says, indeed, that the water does not continually touch the crucible, but he pretends that it oscillates like a ball which is let fall on a horizontal plane. The drop of water, according to M. Laurent, is submitted to a vibratory motion which varies every instant, and this motion is produced by the steam which is formed below every time that the water touches the crucible, that is to say, that the drop of water raised up by the steam falls to be raised up *de novo*, and so on.

The author of the memoir under consideration regards the explanations hitherto given as inadmissible; but, however, he does not propose any other; but he presents this memoir as the prelude of a long work to which he continues to apply himself, and it is to be presumed that when he has collected a great number of observations, he will endeavour to harmonize them, and that he will produce peculiar theoretical views. At present our task is confined to mentioning the principal experiments detailed in this first part.

It was generally believed that water could present the phenomenon to which M. Boutigny had given the suitable name of *calefaction*, only at a very high temperature; however, it was produced, in a very manifest manner, in a small leaden crucible.

Now, it is known that this metal enters into fusion at about 260° centigr. It must, therefore, be concluded, with M. Boutigny, that water may be *calefied* rather below that degree; but on setting out from this temperature, *calefaction* (we always avail ourselves of the author's expression) continues to be produced with more or less intensity. M. Boutigny thinks that this phenomenon might perform an important part in the explosion of steam-engines, and he has proposed to make it a subject of especial study.

The author has much varied this kind of experiments, and has subjected successively to *calefaction*, alcohol at different degrees of concentration, ether, the essences of turpentine and lemon, alkaline and saline solutions, acids, &c. M. Pouillet had already studied the effects of this instantaneous influence of heat on the aqueous solutions of baryta, strontia, potassa, and soda, and he arrived at this very remarkable result, that during the time occupied by the experiment, the body which was volatilized and that which remained were in different electrical conditions.

M. Boutigny indicates in his memoir the observations which he has been enabled to make concerning all the bodies which he has submitted to this kind of experiments, and we cannot give them here in detail; but there are some which we may mention, because they have appeared to us of high interest. The Academy will doubtless think them worthy of its attention. One

* *Journal de Pharmacie*, 1830, t. xv. p. 666.

† *Annales de Chimie et de Physique*, t. lxi. p. 319.

of them relates to ether. M. Boutigny has seen that this liquid, distilled, drop by drop, in an almost red-hot platinum crucible, is calefied as well as water, that it forms itself into a globule without manifesting any sign of ebullition; it afterwards acts rapidly, and does not seem to wet the crucible. However, it always goes on diminishing, but with much less promptitude than if the vessel were cold. During this slow evaporation, a most penetrating vapour is disengaged, which has nothing in common with that of ether. M. Boutigny at first attributed it to formic acid; but he is more disposed now to think that it is aldehyde, and indeed there is a great analogy of smell. We have endeavoured to acquire some certainty in this respect, by repeating this curious experiment in a closed apparatus; but we have been unsuccessful. The product obtained was only ether which had become rather empyreumatic. The author thinks that a current of air is indispensable to the production of this irritating vapour. In operating under the circumstances pointed out by M. Boutigny, we made a very interesting observation: we steeped in the crucible a strip of litmus paper, to ascertain whether this vapour was acid, and we saw that while the portion dipped in retained its colour, that which was in the orifice turned red. The temperature was therefore higher in this part, and it may be presumed that a slow combustion takes place there, analogous to that which is produced in the beautiful experiments of M. Döbereiner, and a more extended study of this curious result will doubtless throw great light on certain phenomena of spontaneous inflammations, for which we could not account.

Another experiment of M. Boutigny, which is still more remarkable, is that on anhydrous sulphurous acid. We know the excessive volatility of this acid, and that it can be kept only in hermetically sealed vessels, and that it enters into ebullition to resume the gaseous state as soon as vent is given it. However, M. Boutigny conceived the happy idea of submitting it to *calefaction*, and he has observed that if a few drops of it be poured into a platinum capsule heated almost to redness, this acid gives rise to the same phenomena as the other liquids. It is at first strongly agitated, afterwards forms itself into a globule, becomes motionless, milky, and even seems to be crystallized. If the capsule is laid hold of with a small pair of pincers, and the little spheroïd immediately turned out on the hand, the sensation of cold is experienced. M. Boutigny at first supposed that the sulphurous acid absorbed, during its temporary stability, oxygen from the air, and that it passed to the state of sulphuric acid; but this idea not being justifiable by the results, he afterwards supposed that the sulphurous acid underwent a great diminution of temperature, in order to become solid. However, as we were aware that M. Bussy had been able to effect this congelation by the prodigious cold produced by moistening the flakes of carbonic acid with ether, it was impossible for us to admit that a similar depression of temperature could occur under such unfavourable circumstances. It was evident, however, that there had been cold; but all that could be reasonably admitted was, that the evaporation, much less than under ordinary circumstances, produced sufficient cold to congeal, not only the acid itself, but even a portion of the moisture of the surrounding air, and thus determining the hydratation of the acid. Indeed, if the little solid globule is put quickly into a tube, and corked down immediately, it is seen to disappear, but not immediately. There may be observed in the place which it occupied a very perceptible dew, which remains even when the tube is uncorked. However, whether the explanation which we have given of this solidification be the correct one or not, the phenomenon is no less curious, and deserves, in our opinion, very serious attention. This is, without doubt, a fine subject for investigation; but it will seem just to leave the first fruits to him who has for a long time devoted whole nights to it.

We have the honour of proposing to the Academy, to inform the author of the interest it takes in the first part of his work; and we request it to engage him to pursue investigations which promise such important results.

The conclusions of this report were adopted.

INVESTIGATIONS CONCERNING THE NATURE AND CONSTITUTION OF AMMONIACAL COMPOUNDS.*

BY DR. KANE.

Dr. Kane had formerly proved that in the combination of chloride of mercury with ammonia, the latter lost an equivalent of hydrogen, and that an amide was the result. He wished to extend his investigations in this point of view to other ammoniacal compounds, which he has lately done in a memoir on the sulphates, proto-nitrate and

* *Journal des Connaissances Médicales*, March, 1840.

deuto-nitrate of mercury, ammoniaco-mercurials, and on the ammoniacal compounds of copper and zinc. This immense work, full of cyphers and atomic formulæ, affords but little matter for analysis. We are about to give a succinct idea of the theoretical considerations which the author has deduced from it.

Ammonia, represented by the formula NH^3, has already been the subject of many theoretical speculations. The simplest manner of viewing it, and that which presents itself first, is to consider it as a base combining with acids with certain proportions of water.

M. Berzelius has wished to make it appear that there is no water in these combinations; he has added speculatively to ammonia an atom of hydrogen, and has formed from it a body, NH^4, which he has called *ammonium*, and assimilated to the metals, an oxidized metal in salts with the proportion of oxygen which is attributed to water: thus the sulphate of ammonia becomes *sulphate of oxide of ammonium*, hydrochlorate of ammonia, *chloride of ammonium*, &c. This bold theory, which certain facts supported, was opposed to many others.

Another theory, if not invented, at least completely developed and studied by Dr. Kane, considers ammonia as an amide, amiduret of hydrogen. Amidogen should be a body formed of the same elements as ammonia, minus one equivalent of hydrogen; consequently it is written $N H^2$: it may be combined with metals, and replace chlorine and hydrogen in certain organic combinations. Dr. Kane's ideas are contained in the following propositions:—

1st. Hydrogen, in all its forms, is analogous to certain electro-positive metals; its compounds act like theirs in similar circumstances.

2nd. Ammonia is an amiduret of hydrogen, which should be written $N H^2 + H$.

3rd. Amidogen may be combined with metals; and the metallic amidurets have a singular tendency to combine with the chlorides and oxides of the same metals.

4th. Amiduret of hydrogen may fulfil the same functions as water, or oxide of hydrogen, considered as basic water, water of crystallization, or saline water.

5th. The oxide of ammonium ($N H^4 O$) is an oxy-amiduret of hydrogen: sal ammoniac is a chloro-amiduret of hydrogen.

6th. The ordinary ammoniacal salts combine with those salts of copper and zinc which contain two equivalents of oxide.

ON FREE HYPO-SULPHUROUS ACID.†

BY M. LANGLOIS.

Since the works of Herschel and Gay Lussac on hypo-sulphurous acid and its combinations, nothing new has, I believe, been published on this subject. These philosophers have tried to insulate this acid by decomposing hyposulphite of strontia by the strong acids. Herschel employed sulphuric acid, and M. Gay-Lussac hydrochloric acid with alcohol. But whatever process was used, the acid had but an ephemeral existence; it was immediately transformed into sulphurous gas and sulphur; still it was not pure.

These investigations proved, however, that hypo-sulphurous acid existed, and that, varying the means, it might doubtless one day be set at liberty.

The study of the properties of hypo-sulphite of potassa has led me to the discovery which I have the honour of communicating to the Academy. This salt was obtained by the ordinary method, by acting with sulphur on a solution of bisulphite of potassa. Its physical characters are not the same as indicated by the English chemist and other authors. The form of its crystals is prismatic and not that of needles; it is not deliquescent, and reddens tincture of turnsole. Dissolved in water, and submitted to the action of energetic acids, it does not undergo any alteration. After having poured into this solution an excess of sulphuric acid, the liquid was left alone for several days, and lost none of its transparency. It is worthy of remark, that the supernatant liquor in which the crystals of hyposulphite are formed, produces, with the acids, sulphurous vapours and a deposit of sulphur. The force which determines the crystallization, therefore, seems to modify the constitution of the salt, since the crystals do not act like the liquid which has furnished them.

These observations naturally lead to the experiments made for the purpose of separating hyposulphurous acid from hyposulphite of potassa.

First I employed tartaric acid; I easily obtained a precipitate of bitartrate of potassa, without any sign of decomposition of the liberated acid. I should have persisted in this means, but I preferred availing myself of perchloric acid, which forms with potassa a more insoluble salt than that produced by tartaric acid.

Having dissolved hyposulphite of potassa in cold water, I poured into the solution, by small quantities at a time, perchloric acid. Perchlorate of potassa was quickly deposited,

† Academy of Sciences, sitting of the 16th March, from *Comptes Rendus*, No. 11.

and the liquid remained transparent. With a little attention, it is easy to attain the point at which the liquor contains neither perchloric acid, nor hyposulphite of potassa, but only hyposulphurous acid. It is afterwards filtered, in order to separate the perchlorate.

The concentration of the acid can only take place at a gentle heat; if the temperature were raised too high, it would immediately be decomposed. To avoid this inconvenience, it is better to concentrate it over sulphuric acid in the vacuum of the pneumatic machine.

The acid thus obtained is liquid and without colour; it has somewhat of a syrupy consistence. There is a point beyond which its density cannot be augmented without part being decomposed. Its taste is strongly acid and bitter; it does not seem very caustic.

Exposed to the air it attracts moisture.

Introduced into a small glass tube and heated, hyposulphurous acid is decomposed at the temperature of 80° centig. Sulphurous acid gas and a deposit of sulphur are produced.

It does not disturb the salts of lime and strontia. The precipitate which it forms in the solution of baryta disappears by adding distilled water or a few drops of nitric acid.

It has no effect on the solutions of the salts of iron, zinc, and copper.

In the salts of lead, it determines a white precipitate which becomes black by heat.

It forms, at first, in the solution of nitrate of silver, a yellowish-white deposit which soon becomes black. Sulphuret and sulphate of silver are produced.

The salts of mercury and platinum are precipitated black.

It acts, evidently, on the different salts, like hyposulphite of potassa.

Nitric acid acts instantly on concentrated hyposulphurous acid; deutoxide of azote is disengaged, sulphur is deposited, and the liquor contains sulphuric acid.

The action of chloric acid is not less remarkable than that of nitric; the decomposition of the two acids takes place immediately with a tumultuous motion. Sulphur and chlorine are manifested, and reagents indicate in the liquor the presence of sulphuric acid. The phenomenon is similar to that which is observed when a few drops of chloric acid are poured into alcohol or ether. In the latter case there is more inflammation of the combustible body in excess.

Chloric acid, whose action on hyposulphurous acid is so powerful, does not act on hyposulphite of potassa.

The employment of perchloric acid, to extract hyposulphurous acid, should make us presume that these two acids may be kept in contact, without being destroyed. Indeed, perchloric acid, mixed with hyposulphurous acid, produced nothing.

Sulphuric acid effects its decomposition by raising the temperature.

Hydrochloric acid has no action on it.

I have not made any experiments directly with the view of establishing the composition of hyposulphurous acid. My researches in this respect have been confined to hyposulphite of potassa. I am almost certain, that in this acid oxygen and sulphur are found in the proportions indicated by M. Gay Lussac. Hyposulphite of potassa, heated on a sheet of platinum or in a glass tube, allows sulphur to escape; the remainder is formed entirely of neutral sulphate of potassa, without either subsulphate or sulphuret. This fact can only be explained by considering this salt as formed of one atom of potassa and three atoms of hyposulphurous acid. Heat would destroy two atoms of the acid, whose oxygen would be carried to the non-decomposed atom in order to form the sulphuric acid retained by the potassa.

The study of the hyposulphites merits, I think, to be resumed, and had it not been for the motives mentioned in the letter which accompanies this Memoir,* I should not have published these investigations until I had paid more attention to this part of the science.

CRYSTALS OF HYDRATED HYDROSULPHURIC ACID.†

BY F. WÖHLER.

There is probably a crystallizable combination of water with hydrosulphuric acid, but which can exist only at a very low temperature, or under high pressure. In a tube containing, in the condensed state, liquid hydrosulphuric acid prepared in the usual way, by the spontaneous decomposition of bisulphuret of hydrogen ($H^2 S^2$) in close vessels, in a short time little transpa-

* This Memoir was accompanied by the following letter:—

"This Memoir is intended to publish the means by which I procure isolated hyposulphurous acid. On the 10th of March, I made a verbal announcement of this discovery to the Society of Natural History of Strasburg. One of the members, M. Oppermann, communicated this fact to Professor Persoz, who came next day to tell me that he had arrived at the same results, but by a different process. This circumstance obliges me, in order to preserve my right of priority, to publish my observations earlier than I should otherwise have wished to do."

† *Annalen der Chemie und Pharmacie.*

rent crystals were formed, which were colourless, quite different from those of sulphur, and which, in this instance, could only be hydrated hydrosulphuric acid. After it had been kept a year, this tube exploded on being removed from a cold room to a warm one, but in such a manner that it broke only the extremity at which it had been closed; the rest remained entire. I had still time to observe that these crystals were destroyed and disappeared with disengagement of gas immediately after the removal of pressure.

Some direct experiments made with a view of producing a similar combination gave the following results:—Water, saturated a 0° with hydrosulphuric acid gas, deposited nothing. A mixture of alcohol and water, which did not congeal at −18°, was reduced to that temperature in a mixture of snow and sea-salt, and saturated with washed hydrosulphuric acid gas. There was very soon formed a crystallization similar to that of ice, but which disappeared with a vivid effervescence, and a production of froth, as soon as the vessel was withdrawn from the frigorific mixture, and held in the hand. Hermetically confined in a tube, the crystallization was not more stable, probably because, on account of the smallness of the quantity, the pressure was not sufficiently strong. But every time the tube was cooled to −18°, the crystallization was again produced, and I thought sometimes that I distinguished octohedral crystals in it. By using hydrated acetic ether, which does not congeal at −18°, the same phenomena are obtained.

REPORT CONCERNING A MEMOIR BY M. LASSAIGNE, ENTITLED: RESEARCHES ON THE CHEMICAL ACTION WHICH THE METALLIC SALTS EXERT ON LIQUID ALBUMEN, AND ON CERTAIN TISSUES OF THE ANIMAL ECONOMY.*

BY MM. ROBIQUET AND PELOUZE.

The memoir, of which the Academy has charged us to render an account, may be considered as the sequel and unfolding of a former work by M. Lassaigne, on the combinations of bichloride of mercury with albumen and fibrin.

The author has proposed to examine in this new memoir the chemical nature and principal properties of the compounds which result from the contact of certain metallic saline solutions, whether with albumen and fibrin, or with certain tissues of the animal economy. His principal object has been to ascertain by experiment, whether these compounds result exclusively from the combination of animal matter with a metallic oxide, as some chemists affirm, or whether, on the contrary, they contain the elements of the salt unimpaired, as many scientific men think, and particularly MM. Berzelius and Thenard.

Fibrin, gelatine, albumen and caseum never present, as we know, crystalline forms, whether they be considered as separately or in any combination whatever, of which they form part. It seems that nature wished to prevent the serious inconveniences which might arise, in the animal economy, from a tendency to crystallize, in the substances which are spread in it with profusion. The chemical history of these substances is so little known, that not only can it by no means be affirmed that they have been obtained in the free state, but we are still ignorant whether, even neglecting to take account of foreign matters of an inorganic nature which may alter them, they should be considered as peculiar immediate principles or as complex substances. Besides, they do not crystallize, and on the contrary always tend to deprive of that faculty all bodies with which they are put in contact; they are neither volatile nor fusible without alteration; their combustion always leaves ashes, whatever trouble may be taken to avoid them; their solutions are altered with rapidity; moreover, once engaged in combinations, they can seldom be separated without undergoing more or less extensive modifications in their properties. There results from these various circumstances little eagerness, in general, to study the matters of which we are speaking: we are always afraid of operating on impure, indeterminate substances; and without their connexion with important physiological phenomena, no one would devote himself to such a subject. Those who enter upon this obscure part of animal chemistry are therefore deserving of praise, and if, in that, as in other things, accuracy and precision be required of them, it would be, we must say, unjust to ask more than the subject permits.

We have shown the object which M. Lassaigne has proposed to attain. The question with which he is occupied is not only interesting to chemistry; it is still more important to toxicology and legal medicine.

What does a metallic saline solution become in its contact with albumen and animal tissues?

What does a poisonous metallic solution, a salt of copper, for example, become when injected in the stomach of an animal?

* *Academy of Sciences*, sitting of the 23rd of March; *Comptes Rendus*, No. 12.

Under what form, in what state of combination is it met with?

M. Lassaigne commences by laying down the distinction which must be established between the effects resulting from the action of certain salts in concentrated solution on liquid albumen, as met with naturally in most of the animal fluids, and the effects which albumen dissolved in a great quantity of water presents.

In the first case, the earthy salts form a precipitate which seems to be entirely owing to a deficiency of solvent; for in the first place, the precipitate is dissolved rapidly in cold water, and in the next place, the same salts do not render turbid albuminous solutions previously diluted with water.

As for the metallic salts, properly so called, which form with albumen true insoluble combinations, they do not make any difference with weak or concentrated solutions of albumen.

M. Lassaigne has experimented with salts of very different nature, with sulphates, nitrates, chlorides, acetates, with salts of lead, copper, silver, zinc, iron and platinum. He has discovered that albumen is susceptible of being combined with all these salts without eliminating the acids contained in them, and without even modifying their state of saturation. In no case has he been able to recognise a combination of albumen and a metallic oxide, not that such compounds may not exist, but they are formed under different circumstances. According to him, albumen may be combined in definite proportions with metallic salts. By adopting the number, 2387.50, as the weight of the atom of this immediate principle, and representing this quantity by A. the principal combinations of albumen with the salts may be represented as follows:—

A^6, $(Pb\ O)^3$, $C^4\ H^6\ O^3$ = albuminate of tribasic acetate of lead.

A^6, $Pb\ O$, $Az^2\ O^5$ = albuminate of nitrate of lead.

A^3, $Cu\ O\ C^4\ H^6\ O^3$ = albuminate of acetate of copper.

A^4, $Cu\ O\ S\ O^3$ = albuminate of sulphate of copper.

A, $Ag\ O\ Az^2\ O^5$ = albuminate of nitrate of silver.

A^6, $Pt\ Cl^4$ = albuminate of chloride of platinum.

It is, however, only with much reserve that M. Lassaigne attributes to the preceding salts a truly atomic composition, and we believe he is right; for even setting aside the sulphur and the small quantity of saline matter which albumen contains, we do not know whether a single experiment can be quoted in support of any atomic formula whatever, for this substance. Moreover, the experiments of M. Mitscherlich, Jun., on the combination of neutral sulphate of copper with albumen, prove that this combination cannot be washed without undergoing decomposition; water perverts it in such a manner, that long before having employed a sufficient quantity for purifying it, supposing it perfectly stable, it is changed into a combination which contains much less sulphuric acid, more oxide of copper, and, above all, much more organic matter.

Again, the proportions of neutral sulphate of copper and tribasic sulphate of copper, found by M. Mitscherlich in the albuminates which he has made known, differ too much from one another, for the cause to be attributed to errors in analysis. They are owing, doubtless, to the difficulty, perhaps impossibility, of obtaining pure salts. These considerations, and many others, which we will pass over in silence, authorize us in believing that definite proportions, if they exist in the compounds of which we have been speaking, are far from having been sufficiently established by experiment.

We will not speak in detail of the combinations which M. Lassaigne has described in his memoir. We shall confine ourselves to noticing their principal properties. These combinations are amorphous; they contain, at the time of their precipitation, always a very considerable quantity of water, and which ordinarily constitutes about three-fourths of their weight. Those of copper and silver are transparent and coloured, the first green, the second yellow. They are all endowed with the property of being soluble in a great number of salts and other matters, among which we may mention sea-salt, sal ammoniac, nitrate of potassa, iodide of potassium, lime-water and ammonia. They present a singular property, remarked long ago in analogous combinations, and latterly by M. Mitscherlich in albuminous sulphate of copper, viz., that the re-agents which are sometimes used to detect the presence of salts, sometimes to ascertain the proportions of it accurately, no longer cause, in these combinations, the ordinary phenomena of precipitation, or coloration characteristic of these salts. Thus, oxide of copper is precipitated neither by potassa nor by sulphuretted hydrogen, nitrate of silver and nitrate of lead combined with albumen are soluble, when cold, the first in a solution of chloride of sodium, the second in a solution of sulphate of soda. These circumstances, and many others of the same nature, have been noticed with peculiar care by M. Lassaigne, who has felt all their importance.

His experiments on animal tissues have shown him that these matters have the property of combining, like albumen, with metallic salts, without decomposing them, and of forming compounds insoluble in

water, which many solutions may destroy by redissolving the greater part of the metallic salt which was combined with the organic substance. He has operated particularly on salts of copper and lead, and on portions of the membranous tissue of the small intestines, and pieces of skin freed from hair and cartilage.

M. Lassaigne thinks that in the internal administration of metallic salts, there are established in the animal economy, in consequence of absorption, combinations similar to those of which we have been speaking, between the metallic salts and the albumen contained in the different animal fluids, and it is very probable that their medicinal effect is most often thus produced. Again, he thinks it likely, that in the action of a metallic salt on any animal tissue whatever, there is established at first a combination between these two bodies which, setting out with modifying the vital properties of those organic parts, brings about a change in their functions.

He adds, in conclusion, that it would be interesting to examine the therapeutical effects of compounds of albumen and metallic salts.

In generalizing, as he has done, the action of metallic saline solutions on albumen and the tissues of our organs, in calling, more than has hitherto been done, the attention of chemists to the modifications which the intervention of an animal matter might cause in the characteristic properties of salt, M. Lassaigne has executed, in our opinion, a useful work.

The Academy, which honoured, in 1837, with an insertion in the "*Recueil des Savants Etrangers*," a former work of this chemist on the same subject, will see, doubtless, with interest, the perseverance of which he has given a proof.

We have the honour of proposing that M. Lassaigne's memoir be printed in the "*Recueil des Savants Etrangers*."

The conclusions of this report were adopted.

ON BUTTER MELTED, AND ON THE MOULDINESS OF BUTTER.*

BY M. TURPIN.

M. Turpin read before the Academy of Sciences, at its sitting of the 9th of December, 1839, a paper entitled, "On the singular physical and microscopical character which butter melted and cooled suddenly takes, and on the great difficulty with which butter in any state becomes musty or produces mould."

The results of his investigations lead him to the following conclusions:—

1. Natural butter contains a great number of milky globules, which, by becoming decomposed and putrid, occasion the speedy rancid state of butter. Left for some time, it forms throughout its extent a great quantity of pointed crystals, grouped in radiating spheroids.

2. Butter melted and cooled presents scarcely anything more than a great agglomeration of crystallized spheroids, each sticking in as many little portions of fatty matter, and become polyhedrous by the mutual pressure.

3. In these two states, the milky globules, or their sub-globules, which are enveloped with butyrous oil, cannot vegetate into mould unless they at length become stripped of the oil which surrounds them.

4. The best filtered milk always holding in suspension a pretty great number of milky sub-globules, which give to the serum its white opal-coloured appearance, may at length produce more or less mould of milk, according to the quantity of globules.

5. If whey, clarified and filtered, appears by its great limpidness free from globules; if the microscope discovers none, it is because, like those of filtered white of eggs, they are too attenuated and too transparent to be perceived. But if this whey be left for two or three days under an ordinary temperature, the globules increase throughout the whole extent of the liquid. It loses its beautiful transparency, its light colour becomes a yellowish green. It becomes turbid, and loses its milky opal colour. The globules partly rise and come to the surface, where they collect into a mycodermic pellicle of a milk white. These globules, seen under the microscope, appear of a fawn colour, and are endued with a very marked motion.

6. Pieces of butter in the natural state and melted, filled with milky globules, have been exposed for 82 days to the influences most favourable to the vegetation of mould, without their surface presenting any trace of mustiness.

* *Journal de Chimie Médicale*, February, 1840.

ON THE MEANS OF DISTINGUISHING VEGETABLE ALKALIES BY CHLORINE, AND BY THE SULPHO-CYANIDE OF POTASSIUM.*

BY M. LEPAGE.

Last year, M. Pelletier published the fact, that the smallest quantities of strychnine

* *Journal de Pharmacie*, March 1840.

in solution might easily be detected by passing a current of chlorine into it, which causes more or less turbidness, according to the quantity of alkaloid contained in the solution; but I do not know whether that learned chemist has submitted other alkaloids to the action of the same agent,* with the view of ascertaining whether this property of strychnine, of being precipitated by chlorine, were peculiar to it, and might serve, in case of need, as a distinctive character of this alkaloid. With this view, I have tried some experiments on the most commonly employed alkaloids. This work has appeared to me so much the more useful, as bromine and iodine, some years ago used by Dr. Donné with the same object, offered some very curious results, and especially an excellent distinctive character for brucine, by the exclusive property which its alcoholic solution possesses of becoming violet by the addition of a drop of bromine.

I have employed for each experiment 10 centigrammes of alkaloid distilled in 40 grammes of distilled water, assisted by two or three drops of sulphuric or hydrochloric acid, added with a glass rod. The solution effected, I submitted it to the action of a current of chlorine gas for ten minutes; after having repeated this experiment four times on each alkaloid, the following were the results which I constantly obtained:—

WITH STRYCHNINE.

No alteration when it is quite free from brucine; the liquor begins to become milky at the end of about five minutes; this is increased by the continued action of the metalloid for a minute, and the liquid left quiet, allows a precipitate to be deposited.

WITH PURE BRUCINE.

A rather deep red coloration, which appears by the action of the first bubbles of chlorine, but which soon disappears by the ulterior action of this gas: not turbid.

WITH MORPHINE, NARCOTINE, AND EMETINE.

A permanent saffron yellow colour, and a trifling deposit after a long time with emetine only, without any change in the colour of the liquid.

WITH QUININE,† CINCHONINE, AND VERATRINE.

No particular colouring, nor any turbidness.

All the alkaloids used in these experiments were in a state of the greatest purity, except the emetine, which did not appear to be as pure as I could have wished, and which might have some influence on the coloration and precipitate which occurred. The brucine was perfectly crystallised, and had been extracted from the false angustura, which removes all suspicion of the presence of strychnine, as the false angustura does not contain that alkali.

If this action of gaseous chlorine on the precipitated vegetable alkalies, in the state of saline solution, does not offer a distinctive character for each of them, it offers an excellent one for distinguishing strychnine from all the others; and what is no less important, it gives means, simple enough for every one to use, of recognising, in an instant, the least traces of strychnine in the brucine of commerce, which is extracted from nux vomica. This brucine, as I have ascertained by operating on several samples from different sources, always contains strychnine, and sometimes in very considerable quantity, which is not without danger in medical use, since it has been proved by MM. Magendie and Andral that the action of strychnine on the animal economy was to that of brucine as 1 to 12. Thus, in a case where we have a suspected brucine, it would be sufficient, to test it, to dissolve 20 or 25 centigrammes of it in 45 grammes of distilled water, assisted by two or three drops of hydrochloric acid, and to pass a current of chlorine gas for about ten minutes in this solution, which, if it contain strychnine, will become milky in about five minutes, and will yield, if left to rest, a precipitate which, washed with pure water, in which it is insoluble, as well as in ether, will be very soluble in alcohol, and will dissolve in powe fully acidulated water, but with difficulty. This last character distinguishes it essentially from normal strychnine.

This method is so delicate, that it allows the detection of three milligrammes of strychnine, as I have ascertained.

Notus (*Journal de Pharmacie*, Decem-

* M. Pelletier, in an interesting article published in the *Journal de Pharmacie*, vol. 24, considering the action of chlorine on different alkaloids, and especially on strychnine, has pointed out many of the facts mentioned by M. Lepage: they will serve, therefore, to confirm his accuracy.

† It results, however, from the experiments of MM. André, Pelletier, Brandes, &c., (see the *Chemist*, No. 4, p. 199,) on the action of chlorine on quinine, that this organic base is more or less altered, and that there then occur either brownish red colourings, or precipitates of a resinous aspect, also brownish.

ber 1836) recommends sulpho-cyanide of potassium as a test for strychnine; it yields, he says, a salt in fine crystals, but it is affirmed that quinine is acted on in the same manner.

I have likewise tried a series of experiments, all of which I have repeated a great number of times, with the view of ascertaining, if in the above mentioned compound might be found a faithful test, and free from all objection, for some of the vegetable alkalies. Although Notus has not informed us in what vehicle he dissolved the strychnine which he used to discover this reaction, every thing tends to make us believe that it was in acidulated water, for alcohol has the property of dissolving the compound which is formed.

I therefore, as in the preceding experiments, employed each time 10 centigrammes of the alkaloids, dissolved in 40 grammes of distilled water with one or two drops of hydrochloric or sulphuric acid, and I always obtained by adding, to a slight excess, a solution of sulpho-cyanide of potassium at 24 :—*

WITH STRYCHNINE.

By the simple mixture of the liquors, a beautiful crystallization presents itself at the end of two or three hours in the form of needles.

But if, instead of simply mixing the two liquors, it is briskly stirred with a glass rod, the formation of the compound takes place in a few minutes; the crystals, in this case, are less characteristic.

WITH BRUCINE.

At the end of from 12 to 36 hours, a somewhat sandy deposit of white crystals;

But, by stirring the liquid, the compound occurs in about ten minutes; it is then often pulverulent.

WITH CINCHONINE.

Frequently nothing by the simple contact of the two liquids, but by stirring, always a precipitate which is presented under the form of small bracteæ very much resembling acetate of mercury.

WITH QUININE.

After from 12 to 36 hours, a greenish yellow compound is presented under the form of a mass formed by the reunion of very small needles, not offering any resistance.

By stirring the liquid, this compound is formed much sooner; it is then pulverulent, but always possesses the same colour.

WITH VERATRINE AND EMETINE.

Pulverulent precipitates, which are formed immediately, and which are insoluble in an excess of alkaloid.

WITH MORPHINE AND NARCOTINE.

Never anything, either by simple mixture or stirring.

All these compounds, which I have considered as combinations of sulphocyanide of potassium and salts of the vegetable alkalies, from some experiments which I have made for the purpose of convincing myself of it, possess the following properties: they are soluble in water (after, however, the supernatant liquor has been decanted, which always contains a little sulphocyanide of potassium which has been added in excess; for I have remarked that they were insoluble under the influence of this reagent, or that they required for their solution an enormous quantity of water). These compounds are likewise very soluble in alcohol, insoluble in ether, with the exception of those formed in the alkaline salts soluble in that liquid, all soluble in concentrated nitric acid, to which they communicate, except that formed by the brucic salts, a clear wine colour, which disappears entirely in ten or twelve minutes. The brucic compound, on the contrary, communicates to the acid a fine blood-red colour, which stands, and is turned to violet by the addition of one or two drops of protochloride of tin (a distinctive character of brucine).

The colour of the compound formed in the solutions of quinine joined to the property possessed by its solution of becoming green by the addition of chlorine in solution and ammonia, prevents their being confused with any other.

The resemblance of the compound obtained in the salts of cinchonine to the protacetate of mercury, presents likewise a very distinctive character of this alkaloid.

The precipitates formed in the salts of emetine and veratrine have no value as distinctive characters.

The crystalline form of the compound obtained in the solutions of strychnine by the simple mixture of the reagent offers a good distinctive character of that alkali; but it possesses one more valuable still, and to which I call the attention of physicians and apothecaries who may be called forward in medico-legal cases where strychnine has been used in the commission of crime. It is the exclusive property possessed by its aqueous solution, of being decomposed by chlorine gas, and of causing a white precipitate, insoluble in water and ether, ver

* The crystallization of the compounds in question is not always sufficiently decided to allow us to judge in all circumstances concerning the nature of such and such a crystalline precipitate; for though that furnished by strychnine is constantly more clear than the others, analogous crystallizations may be obtained with codeine, quinine, cinchonine, and brucine.

soluble in alcohol, and very sparingly so even in strongly acidulated water. This precipitate dried on a watch-glass does not give any particular colour when treated with nitric, sulphuric, and hydrochloric acids.

It is needless to mention that in this action of chlorine gas on the solution of this compound, sulphocyanogen never precipitates, the solution being much too weak for that to occur; but the liquor nevertheless loses the characteristics of the sulphocyanide, for it does not redden with the salts of iron after the action of the gas.

I wished to ascertain if, profiting by this property of sulphocyanide of potassa to form an insoluble compound in even the weakest solutions of strychnine (I have proved that one or two centigrammes may be detected in twenty grammes of liquid), and by that also which chlorine possesses of decomposing its aqueous solution, these means might be used with confidence in medico-legal investigations. Having made three experiments on this subject, I have arrived at such satisfactory results that I do not hesitate, for a moment, to propose this means as the most accurate in these kinds of researches.

I poisoned two cats, one with three grains of strychnine, the other with two grains only; the first was opened at the end of twenty-four, and the second at the end of twelve hours; the third experiment consisted in detecting three grains of strychnine which had been kept for six days in a matrass with two pieces of flesh and a certain quantity of weak broth, at a temperature of 18°.

The following is the process which I have followed, and which I propose should be followed in these investigations: after having removed the œsophagus and stomach of the poisoned animals, these organs, being cut in pieces, were boiled in a sufficient quantity of distilled water, to which were added five or six drops of hydrochloric acid, so as to cause the water to redden turnsole paper. After ten minutes boiling, the liquor was filtered, and a certain quantity of subacetate of lead (tribasic acetate of lead) added, for the purpose of precipitating the colouring and albuminous matter; after having filtered the liquor again, a current of hydrosulphuric acid gas was passed into it, in order to precipitate, in the state of sulphuret, the excess of subacetate of lead; all that being decomposed, the sulphuret of lead was allowed to deposit, and was separated by filtration; the filter was washed with distilled water and the liquor evaporated to about 40 or 45 grammes in a sand-bath in a porcelain capsule; it was left to cool, and a few drops of a solution of sulphocyanide of potassium were poured into it; there was almost immediately obtained, by stirring with a glass rod, a precipitate of small white needles; it was allowed to deposit completely; this supernatant liquor was removed, and it was washed only once, with a small quantity of distilled water, then sufficient was added to dissolve it. By passing a current of chlorine gas into this solution in a few minutes the water became turbid, and afterwards, by allowing it to stand, a precipitate, possessed of the before-mentioned properties, was formed.

In a case in which, after the precipitation of the lead by sulphuretted hydrogen, the liquor is still colored, it may easily be decolored by boiling with a little animal charcoal which has been well washed in hydrochloric acid.

By passing a current of chlorine gas into the product of the evaporation of the liquor from which the sulphuret of lead has been separated, strychnine is, it is true, precipitated; but this *modus operandi* does not admit, in my opinion, of as much accuracy as that which I propose; for it might happen that, without containing strychnine, the liquor might nevertheless furnish a precipitate by chlorine, if it contains gelatine, for example. If it happen, by chance, as it has done with me once, that the product of the evaporation of the liquor, separated from the sulphuret of lead, acquires a red colour from the sulphocyanide, (and it is always as well to try on a small quantity of the liquor before pouring the reagent into the whole), which coloration would be owing to the presence of iron, two means may be made use of to free it from it. The first, which I have found very successful, consists in boiling the liquid with two or three drops of nitric acid, in order to convert the iron into a peroxide in case it is not so already, and in pouring into the liquor, when cooled, a perfectly neutral solution of succinate of ammonia, to precipitate the iron, in the state of a succinate, and filtering; the ammoniacal salt which remains in the liquor has no influence, either in impeding or favouring the action of the sulphocyanide or the salt of strychnine.

The second means consists in adding to the liquor a little calcined magnesia, drying the product in the sand-bath, and treating it, when hot, by alcohol at 40, which dissolves only the strychnine. The latter may easily be obtained by evaporation; it is then dissolved in distilled water aided by one or two drops of acid, the sulphocyanide is poured into the solution, and the operation is concluded as above mentioned.*

* The process which M. Lepage here points out for detecting the presence of strychnine, in *chemico-legal* investigations,

although very ingenious, appears to us to give rise to some reflections.

When we are required to decide and to pass judgment on which may depend the honour and life of an accused person, there are required, in our opinion, palpable proofs to get a conviction. Now, it is not after only a few reactions or a few changes of colour that we can decide upon the existence of organic principles especially, as they are so easily modified and transmuted by chemical agents. We should, before all, seek to isolate the poisonous substance, in order to examine it in all respects, and to submit it to all the reactions which characterize it. Many means have been proposed with this view, which need not be repeated; the following has been found successful. It rests upon the facility with which tannin can detect and isolate slight traces of vegetable alkaloids, by causing sparingly soluble and very bulky whitish precipitates. This is a brief detail of the process to be followed:—

The suspected matters, or the organs wherein *unabsorbed* poison is supposed to remain, are taken; then, after having divided them, they are treated twice over by very faintly acidulated boiling alcohol; it is filtered, distilled in the sand bath as far as possible, and water is added to the residue. When the liquor is almost completely neutralized by a few drops of pure ammonia, and cooled, it is filtered in order to separate any fatty or other matters; there is then poured into this liquor a very concentrated solution of pure tannin, until the precipitate ceases to fall. This precipitate, collected on a fine cloth, is washed with a little cold water, then separated and triturated with an excess of slaked lime reduced to a fine powder; the mixture dried at 100° centig. is pulverised and boiled in rectified alcohol. This alcoholic vehicle filtered leaves, after a well-directed evaporation, the alkaloid sought for, which must be combined carefully with an acid, in order that it may be obtained in a crystallized saline form; it is in this state only that the alkaloid can easily be separated from it, and afterwards submitted to all the tests of reagents, among which the means presented by M. Lepage will find a place.

In very complex mixtures there have been found very small quantities of alkaloids added, directly or indirectly, in matters which contained them.

II. CHEMICAL MANUFACTURES.

REPORT CONCERNING A MEMOIR BY M. BOUTIN, ON THE PRODUCTS RESULTING FROM THE ACTION OF NITRIC ACID ON THE RESIN OF ALOES, AND THEIR APPLICATION TO DYEING.*

BY MM. THENARD, ROBIQUET, AND PELOUZE.

The resin of aloes, submitted to the action of nitric acid, gives rise to several products, among which a remarkable acid is found, whose chemical examination and applications in the art of dyeing constitute principally the memoir of which the Academy has commissioned us to render an account. This acid was first noticed in 1808, by M. Braconnot, and was called, by him, aloetic acid. He obtained it in a yellow, uncrystallisable, and extremely bitter powder, rather soluble in water, to which it communicates a fine arterial blood-red colour, and forming with potassa a deep red salt, which is capable of detonating with the violence of gunpowder, disengaging a decided smell of prussic acid, and leaving after combustion a slight carbonaceous trace.

M. Braconnot also discovered oxalic acid among the products of the action of nitric acid on aloes.

Some time afterwards, M. Liebig devoted his attention to the same subject, and asserted, that besides the two above-mentioned acids, aloes contained a third, carbazotic acid, when submitted to the prolonged action of a great quantity of concentrated nitric acid. He described some of the principal properties of aloetic acid, and remarked, that silk boiled in an aqueous solution of it acquired a beautiful purple red colour, which resisted the action of alkalies and acids; that wool was dyed black, and cotton pink. However, M. Liebig did not push his investigations on this subject any farther.

The history of aloetic acid presents, therefore, many deficiencies, which M. Boutin has endeavoured to fill up; and if, in quitting, for manufacture, the Museum where he was preparer, he regretted being unable to complete, as he could have wished, the scientific part of his memoir, in requital he

* *Academy of Sciences*, sitting of March 16th, 1840.

has found himself in a position, in his dye-house, to make applications to the arts, which would, perhaps, have escaped him in his laboratory.

M. Boutin obtains aloetic acid by a process similar to that pointed out by M. Braconnot: he considers the yellow colour attributed to it as a sign of impurity, and recommends, in order to free it from matters which soil it, that it be washed with warm water until it acquires a fine purple red colour. After which, there only remains to unite it with potassa or soda, to crystallize the salt several times, and to decompose it with hydrochloric acid, which, to be perfectly pure, requires only washing with warm water.

Aloetic acid, which M. Boutin designates polychromatic acid, does not present crystalline forms, from whatever solvent it may have been separated. It is a powder of a deep red-brown, very bitter and astringent, without any perceptible smell, requiring for its solution nearly 900 times its weight of cold water, and only 70 or 80 parts of alcohol.

A temperature of 300° or 400° centig. decomposes aloetic acid instantly, which fuses and detonates gently. On red-hot charcoal it disengages a purple vapour, and gases of a cyanic smell. All its salts are coloured, and most frequently insoluble. Some of them, and particularly the aloetate of silver, fulminate when heated. Those which are insoluble, or but little soluble, may easily be prepared with aloetate of potassa, by double decomposition.

M. Liebig had asserted that aloetate of potassa is decomposed by alcohol, which separates from it nitre and a yellow bitter matter. This circumstance is owing, in M. Boutin's opinion, to the impurity of the salt on which M. Liebig operated; for he had not reproduced it with the aloetate of potassa as above mentioned. This salt remains unalterable in alcohol. M. Boutin's observation appears so much the more correct, as M. Liebig has not said any thing to lead us to believe that he had obtained pure aloetic acid.

With respect to the purity of this substance, as prepared by M. Boutin, we may add, that there is nothing to prove that it is complete, since he has not given us any information concerning its elementary combination, and that of its salts. However, as aloetic acid and the aloetates always present the same physical properties, as besides it forms with potassa a well crystallized salt, in which there is never perceived a single homogeneous matter, we consider it very probable that the aloetic acid prepared by the process of M. Boutin is very pure.

The elementary analysis of a fine sample of this acid presents the following numbers:—

Carbon	= 40·0
Hydrogen	= 1·1
Azote	= 12·2
Oxygen	= 46·7

which, in equivalents, leads to the formula

$$C^{15}\ Az_2\ H^2\ O^{13}.$$

This analysis, to be considered exactly correct, requires to be repeated and compared with that of some aloetates. It is sufficient, however, to distinguish it from indigotic and carbazotic acids, which, especially the latter, much resemble it. This analysis is also sufficient to prevent aloetic acid being confounded with the substance which M. Gerhardt has lately discovered as the product of the action of nitric acid on hellenine, and which he has called nitrohellenine.

M. Wöhler, by deoxidising carbazotic acid by a process similar to that by which blue indigo is transformed into white indigo, has obtained a new acid, which he calls nitro-hematic. This skilful chemist has not given its elementary composition. The properties of nitro-hematic acid differ so little from those of aloetic acid, that we should not be surprised if these bodies were identical, and the dissimilarity in some cases is so feeble, that it might be owing to the impure condition of the nitro-hematic acid. The same may be said of the yellow bitter substance discovered by M. Braconnot among the products of the action of nitric acid on the resins of gamboge and myrrh. It seems to us likewise to be possible that aloetic acid might result from the treatment of indigo by nitric acid, after the formation of indigotic acid, and before that of carbazotic; for on one part the aloetic acid is changed, as we have said, into carbazotic acid, giving rise simultaneously to a peculiar matter, cyanyle, which is likewise found, according to M. Boutin, in the products resulting from the decomposition of indigo by nitric acid, and on another part setting out from the composition assigned by M. Dumas to indigotic acid, and the analysis of aloetic acid, the latter might be formed in a very simple manner. Nitric acid would remove from indigotic acid 3 equivalents of hydrogen, and would replace them in aloetic acid by 1 equivalent of nitrous acid, $Az\ O^3$.

Whatever may be the preceding considerations, which we present with reserve and as simple hypotheses, it is very certain that there are many beautiful experiments to be tried, and an ample harvest of observations to be gathered, in the comparative examination of the products of which we have spoken, and in the precise definition

of the circumstances under which they are formed.

The notions which we possess concerning the different matters which result from the action of nitric acid on organic substances, may be reduced to a small compass; if it be true to say that we have studied some of these products with much care, it is not less true that we may add that their formation is not foreseen by any rule, and that it is scarcely possible to represent by a chemical equation some particular cases of these kinds of reaction. The difficulty seems to be increased when the azote of nitric acid intervenes as a principal constituent of the new matters to which this acid gives rise.

We have said that M. Boutin has noticed the formation of a liquid matter which appears at the same time as the carbazotic acid. This matter, which he has called cyanyle, has scarcely been examined by the author, who has confined himself to the description of some of its physical properties.

Cyanyle is a colourless liquid, of an excessively strong and penetrating odour, which completely resembles that of prussic acid and cyanogen, insoluble in water, more dense than that liquid, and poisonous even in a very small dose. It is volatile, and enters into ebullition without being decomposed at a temperature which seems very high.

M. Boutin has made the interesting observation that wool, and particularly silk, are dyed with facility by aloetic acid, which is capable of communicating to them the most varied shades. According to him, these shades are more solid than those obtained by the colouring matters of organic nature generally employed; and as besides aloetic acid is easily prepared, and as its tinctorial power is very considerable, he thinks that the art of dyeing will derive great advantage from the employment of this acid. Time will decide if the expectations of M. Boutin are well founded; at all events, the results at which he has arrived are curious, and cannot fail to attract the attention of dyers.

We may here give, in a succinct manner, the principal experiments which M. Boutin has published, and which we have witnessed.

By dipping silk into a solution of acetate of copper, as a mordant, at a temperature of 70° or 80° centig., washing it afterwards in an ammoniacal water, and passing it into a bath of aloetic acid, of the same temperature as the mordant, and finishing by washing with weak vinegar, more or less deep wood colours were obtained.

Corinth shades are fixed by immersing the silk in a dilute solution of tartaric or citric acid, at 40° centig., and afterwards passing it into a more or less strong bath of aloetic acid at a temperature of 50° to 60 centig.

The rose shade is obtained in the same way, except that the bath ought to be weaker, and should contain a little alum.

The violet shades deserve especial attention, for we know how rare are the organic matters which yield them. M. Boutin obtains them by adding to the bath of aloetic acid, liquid ammonia and acetic acid. The silk should not be dyed in it until it is well turned to violet, and at the temperature of 50° or 60° centig. For silk, the bath should contain an excess of acid; with wool, on the contrary, ammonia should predominate.

The blue colour is prepared by adding to the bath of aloetic acid a double salt prepared with protochloride of tin and cream of tartar. The bath first turns to violet. There is afterwards added to it a solution of chloride of tin and tartaric acid; a small quantity of liquid ammonia is afterwards sufficient to turn the bath blue. It is then that the silk is dipped into it, and is immediately dyed of a solid blue, as M. Boutin has shown.

Blanched, fancy, and avanturine shades, and some others, may be fixed in silk and wool, by processes more or less analogous.

Green is obtained by passing the silk dyed yellow by carbazotic acid into the blue bath before described.

In conclusion, M. Boutin's memoir contains observations of high importance both to science and the arts.

We have the honour of proposing to the Academy, that it give its approbation to this work, and thank the author for his communication.

The conclusions of this report were adopted.

ON DRINKABLE AND NATURAL WATERS: AND ON THE INFLUENCE OF THEIR PURITY IN DYEING.*

BY M. DUPASQUIER.

M. Dupasquier, Professor of Chemistry at Lyons, submitted to the Academy of Sciences at its sitting of the 13th of January, a paper on drinkable waters, the principal results of which are as follows; it will be perceived that many of them are opposed to generally received opinions:—

1st. The wholesomeness of drinkable waters is not directly referable to their purity; the purest are far from being the most

* *Journal de Chimie Médicale*, Mar. 1840.

wholesome; 2d, hitherto calcareous salts have been reckoned among the most deleterious substances in drinkable waters: this opinion is erroneous at any rate as respects carbonate of lime, which, dissolved in the state of bicarbonate, exerts a beneficial action when its waters are employed as a drink; 3d, constancy of temperature is, at least, as important to be considered in drinkable waters as their chemical composition; 4th, it is generally believed that all the calcareous salts decompose soap, and render waters hard and impregnated with selenite: this opinion is true only as regards those which are directly soluble in water, as sulphate of lime, chloride of calcium, and nitrate of lime; 5th, carbonate of lime, dissolved in drinkable waters with the assistance of an excess of carbonic acid, does not decompose soap, nor does it cause, like other salts of lime, the formation of clots of calcareous soap, even when in great quantity; 6th, Notwithstanding the solution in water of a quantity of carbonate of lime six times more considerable than that of the waters which contain most of it, it still dissolves soap without causing clots; only it assumes a rather milky tint; 7th, carbonate of lime effects the decomposition of soap, only when in so great quantity as in certain mineral waters, as those, among others, of Saint Allyre, in Auvergne, which hold in solution eight or nine times more of this salt than ordinary spring waters; 8th, in the same manner as the purest waters are not the most wholesome, so are they not the best adapted to certain manufacturing operations; 9th, it is an error, for example, to believe that those waters which are least charged with calcareous salts, and which are very fit for scouring silk, are best for the operations of dyeing; numerous experiments have proved, and the result of the practice of the dyers of Lyons proves, that spring waters containing calcareous salts are the only ones proper to give, with all the splendour and solidity of which they are susceptible, the numerous shades of white on silk; that waters from calcareous springs develope the intensity of almost all colouring principles, and can, by giving more beautiful colours, cause in the quantity of tinctorial substances a saving estimated by dyers at one fifth; 10th, lastly, the remarkable effect attributed to the generality of calcareous salts by the dyers of Lyons, is produced only by one of those compounds which exist naturally in solution in spring and river water. Indeed, comparative experiments made with every salt of drinking waters, tried separately, have shown that sulphate of lime, chloride of calcium, and sulphate of magnesia, are nearly without action on the colouring principle of tinctorial matters; the favourable influence exerted on this principle by waters used to dissolve it is entirely owing to carbonate of lime, which explains why the spring waters on the left bank of the Saône, near Lyons, which are very considerably charged with this principle, are so much superior, for dyeing purposes, principally for shaded whites and light colours, to the waters of the Rhone, which hold in solution as much of other salts as these spring waters, but which give by analysis only half as much carbonate of lime.

EXTRACT OF A REPORT ON M. SEGUIN'S MEMOIR; ENTITLED, INVESTIGATIONS CONCERNING THE DISTILLATION OF ANIMAL MATTERS.*

BY MM. ARAGO, BECQUEREL, DUMAS, ETC.

M. Seguin has proposed to collect the gaseous products resulting from the distillation of animal matters; to purify them in a suitable manner; and to render them fit for lighting towns, thus increasing the number of the useful products of the operation.

The muscles of animals, lying, abandoned as useless, in the kennel, have especially attracted M. Seguin's attention. These animal matters, containing at least 60 per cent of water, could not be stored without great inconvenience, and their products besides being very irregular. M. Seguin thought of drying them at a very moderate expense. He effected this in the most satisfactory manner, both as regards economy and salubrity: indeed, the drying is operated by the heat lost from the distilling apparatus, and the wash, being raised above the animal matter, and carried away by a well directed draught, is obliged to traverse the furnace where it is completely disinfected.

After having thus economically dried the matters which he employed without impairing the salubrity of the air, M. Seguin had to study and regulate the distillation of the animal matters; he has determined, by numerous experiments, the most convenient arrangement of the retort, and the most advantageous temperature to be employed in order to produce gas of the best quality. With the disposition of the apparatus adopted by M. Seguin, the retorts should be heated rather above a cherry red.

The products obtained by the distillation of animal matters are, as we are aware, more numerous and complicated than those which have ordinarily to be treated in gas-works. The solid products, which are

* Academy of Sciences, sitting of the 16th of March; from *Comptes Rendus*, No. 11.

bone-black, and the charcoal of the muscles, may be sold in commerce; but this is not the case with the liquid ones, gases and vapours, collected during the operation: these latter are carburets of hydrogen, some liquid, others gaseous; being accompanied by sulphuret of carbon, carbonate, acetate and hydrosulphate of ammonia, these various products require the application of accurate chemical knowledge, in order to be properly purified and appropriated to the purposes for which they are intended.

M. Seguin passes them through a solution of hydrochlorate of lime, which retains all the carbonate of ammonia. The carbonic acid combines with the lime, and the hydrochloric acid with the ammonia. The separation of the sulphuret of carbon, which, in burning, would have produced carbonic and sulphurous acids, and which it was consequently very important to separate from the gas to render it fit for lighting, was a delicate operation: M. Seguin found no guide in the purifying processes commonly used in manufacture, and it is to his chemical knowledge that is owing the surmounting of this difficulty, which was of a nature to render useless the perfection to which he had brought the other parts of his process. He seems to have attained his object by passing the gas when cold slowly from the first purifyer, into a tube filled with pieces of sulphur, and sending it into the gasometer only when it gives no more sulphurous acid by burning: here the sulphur, which, being dissolved in the sulphuret of carbon, retains it without decomposing it, destroys its tension, and thus effects the purification of the gas completely. We think that this ingenious process ought to be considered by oil-gas manufacturers, to whom the presence of sulphuret of carbon is sometimes a very serious inconvenience.

The gas, after being thus purified, does not contain, according to M. Seguin, more than about 10 gr. of empyreumatic vapour in the cubic metre, and it is possessed of so great an illuminating power, that only 22 litres are required to give, for the space of an hour, as much light as Carcel's lamp.

M. Seguin says, that in submitting to distillation a horse of the mean weight of 255, *kilog.*, 75, he obtains:—
22,309 litres of gas capable of maintaining a large lamp for 359 hours;
11 *kilog.*, 35 sal ammoniac;
And 15 *kilog.* 75 bone-black.

We find in documents, which we possess concerning the manufacture of sulphate of ammonia, a proof that there might be obtained, in a continued work, a greater proportion of sal ammoniac, and particularly bone-black: we are, therefore, far from considering the quantity of the products obtained by M. Seguin as exaggerated, and we even think that *in this respect* the account of the manufacture which he has given at the end of his memoir might be ameliorated.

We have seen M. Seguin operate; we have examined the apparatus and mode of distillation which he has established; we have spent an evening in a room lighted with gas prepared by his process; we have observed with interest the perfection to which M. Seguin has brought the construction of the pump, which, under certain circumstances, he uses to compress the gas, and the apparatus which he employs for regulating the efflux of the compressed gas; and we have ascertained that the gas resulting from the distillation of animal matters, as prepared by M. Seguin, burns without smell, and gives a brilliant white light of great illuminating power. We are delighted to acknowledge that M. Seguin has given a proof of talent and perseverance in organizing, as he has done, the distillation, on a large scale, of animal matters, with the view, chiefly, of producing a lighting gas of good quality. We shall not enter into the question of how far those manufactures in which the remains of animal matters, formerly valueless, are used, will be injured by the execution of M. Seguin's projects, by the increase in demand, and consequently in price, which will arise. Still less shall we say anything concerning the financial part of the memoir, because that would be contrary to the customs of the Academy, besides it would require us to devote ourselves to a long series of verifications which could not be done by means of an experimental apparatus; but we own that we have taken cognizance of M. Seguin's labours with great interest, and we propose that the Academy approve of his researches, and engage him to continue and complete the chemical study of the various products obtained by distilling animal matters in the large way.

The conclusions of this report were adopted.

PROPORTIONS OF SUGAR IN THE CANE.*

BY M. PELIGOT.

M. Thenard, in the name of a commission, read to the Academy of Sciences, at its sitting of the 27th of January, a report on a work by M. Peligot. M. Thenard's report touches upon a question too important for us to omit giving an abstract of it.

The authors who analysed the *vesou*, or juice of the cane, regarded it as water hold-

* *Journal de Chimie Médicale*, Mar. 1840.

ing in solution sugar, gum, albumen, mucilage, a kind of saponaceous liquid, acids, and various salts; they considered it also as a liquid of a very complicated nature; whence, in their opinion, the causes which rendered its extraction so difficult.

M. Peligot has shown, on the contrary, that the filtered juice of the sugar cane is formed simply of four parts of water and one of crystallizable sugar; that it is only dissolved sugar, or at any rate, that the organic or saline substances found in it are equal to only from 1 to 7 in 1000 of its weight.

Investigating afterwards how much juice the cane contained, he found, like M. Avequin, that it amounted to 90 per cent. Now, as one-fifth of this is sugar, it follows that the cane ought to yield 18 per cent. of sugar.

How does it occur, however, that manufacturers obtain only 6 or 8 per cent. of sugar, and 2 or 3 per cent. of molasses, from the juice, and even that according to M. de Jabrun, delegate from Guadaloupe, the rendering into sugar can be only 5, and into molasses 1·72. It is because the mill extracts only $\frac{1}{3}$ of the juice, according to MM. Peligot and Avequin, and only $\frac{2}{3}$ according to M. Jabrun.

It has now been proved, that in all cases a great quantity of sugar remains in the cane, or is burnt in the "bagasse." Would it not be possible to extract it by putting the cane in contact with almost boiling water?

It is very certain that the processes of evaporation and boiling leave much to be desired, and give rise to much molasses.

M. Peligot has experimented only on one kind of juice; the results which he has obtained will, therefore, doubtless undergo many modifications; be that as it may, his conclusions are as follows:—

The cane contains more sugar than is thought.

A great quantity of sugar remains in the "bagasse."

The juice is merely water containing sugar.

The boiling of the sugar is operated by very imperfect processes.

It is therefore to be hoped that important improvements will be made in the art of extracting sugar from the cane and that much more will be extracted from it than is at present the case.

ON THE PRESENCE OF ARSENIC IN CAST-METAL.*

Some authors had already established the fact that cast-metal contained arsenic; we have obtained proof of it by trials with Marsh's apparatus. (See the *Journal de Chimie Médicale*, vol. xv. p. 385.)

M. Wöhler, who has made trials on castings, has just announced that he has found arsenic in four species, coming from different high furnaces. He says that the reason why that arsenic has escaped analysis in a great number of cases, is, because it has not always been sought where it was necessary to seek for it in order to find it; he says that in the solutions of iron by sulphuric acid, it is not disengaged with the hydrogen, but that it remains mixed with the carbon and the silex.

M. Wöhler says that it may be extracted from that mixture by submitting it to a solution of caustic potassa, or to the sulphate of ammonia; if it is combined with the latter, it is precipitated by an acid, and is obtained under the form of sulphuret of arsenic.

M. Wöhler has announced his intention of soon publishing a memoir on this subject.

NEW MODE OF APPLYING THE MERCURY TO DRAWINGS OBTAINED WITH THE DAGUERRE'OTYPE.†

BY M. SOLEIL.

The application of mercury, such as has been recommended by M. Daguerre, presents, indisputably, every desirable security for producing fine impressions, and I should not have sought to propose another method, had I not been led to do so, in consequence of the demands of several persons who thought they had discovered in the employment of a liquid metal, some inconveniences among which we may mention the following:—

The difficulty of carrying about liquid mercury; the quantity necessary for operating, which generally amounts to about a kilogramme; the danger of breaking the flask containing the metal; the facility with which the thermometer is broken by blows and by heat; the dissemination of imperceptible globules of mercury which penetrate everywhere, attach to the fingers of the operator, upon the table whereon it is polished, &c., and conclude by soiling the plates in such a manner as to occasion the loss of several hours' labour, &c.; finally, the impossibility of remedying, in certain cases, many of these accidents, as, for example, the breaking of the thermometer.

After many experiments, I determined on the following process:—

Take silver, precipitated from the nitrate by copper ..... 1 part,
Distilled mercury ..... 5 parts.

* *Journal de Chimie Médicale*, Feb. 1840.

† *Comptes Rendus*, No. 9, March 2, 1840.

The amalgam which results from this mixture is confined in a flask stopped with emery.

To use it, a small silver spatula is dipped into it, which draws out sufficient amalgam to rub slightly over a disk of fine silver of about four centimetres in diameter, and of one millimetre in thickness.

This disk, amalgamated for the extent of a fifty centime piece, is placed at the bottom of the mercury-box, which, to receive it, is slightly hollowed in the middle: this bottom is formed of an iron plate.

The impression is disposed of as usual,—and the bottom of the box is very gently heated, in the place which corresponds to the silver disk.

The wick of the lamp should be composed of but three or four threads of cotton, and the flame ought to terminate two or three centimetres from the bottom of the box, in order that a rather elevated heat may always be maintained.

It is thus heated until the image appears: experience has proved to me that the length of time occupied by the operation is not always the same; some impressions require to be subjected several times to the mercury. I will add, in conclusion, that the subjecting the plate to the mercury must not be delayed too long after leaving the camera obscura.

MODIFICATION IN THE PREPARATION OF PLATES FOR RECEIVING PHOTOGRAPHIC IMAGES.*

BY M. SE'GUIER.

M. Séguier presented to the Academy of Sciences two photographic images formed on plates prepared by means of a more simple process than is ordinarily had recourse to.

A single scouring, with tripoli moistened with acidulated water, appears to be sufficient to cleanse the plates thoroughly.

The long operation of polishing with oil is completely done away with, as well as the heating of the plates before and after washing with acidulated water.

This mode of preparing the plates does not occupy more than two minutes.

ON THE GALVANO PLASTIC PROCESSES OF M. JACOBY.†

BY M. DEMIDOFF.

M. Demidoff addressed a summary of his correspondence with M. Jacoby concerning the new art, which the latter calls Galvano-plastic. The letters of M. Jacoby announced the sending of three copies of bas-reliefs obtained by aid of the pile. When these pieces have arrived we shall return in detail to the discovery of M. Jacoby. At present we content ourselves with extracting from the Memoir of M. Demidoff the following passage:—

"Having taken a metallic plate, on which was found a photogenic image produced by the Daguerréotype, our natural philosopher made use of it as a mould in the apparatus, wherein the reduction of metallic copper is operated. The action generated by a voltaic couple having been continued during twenty-four hours, there resulted from it a sheet of galvanic copper of perfect polish, upon which was found a very distinct impression of the photogenic image, only the shades and lights were traced the wrong way."

After this communication, M. Arago exhibited to the Academy two beautiful copper medals obtained at Frankfort, by M. Vogel, by the galvano plastic processes.

M. Becquerel presented some analogous products which had been given to him by M. Boquillon, of the Conservatory.

PREPARATION OF A PAPER FOR RECEIVING PHOTOGENIC IMAGES.‡

BY M. LASSAIGNE.

The photogenic processes which MM. Bayard and Verignon have just published, (see *The Chemist*, No. IV. p. 119), being founded on the principle which I first discovered, and which I put in execution, about a year since, for copying engravings by the action of light, I have the honour of calling to mind, that on the 8th April, 1839, I presented to the Academy a drawing which I had obtained upon *a paper stained of a violet brown by sub-chloride of silver, and afterwards impregnated with a solution of iodide of potassium.*

My communication to the Academy of Sciences has been printed, not only in the *Comptes Rendus des Séances* 1re sem. 1839, p. 547, but in a detailed paper published in July of the same year, in the *Journal des Connaisances Nécessaires*, by M. Chevallier.

REMARKS OF M. BIOT CONCERNING THE PRECEDING NOTE.

The reclamation of M. Lassaigne is perfectly correct, as to priority of the employment of the iodine, and the formation, by this means of copies of engravings in which lights and shades are reproduced in their proper place. If the publicity given to this process by its inventor had not incontestibly

* *Comptes Rendus*, No. 10, March 9, 1840.

† Academy of Sciences, sitting of March 2, 1840.

‡ *Comptes Rendus*, No. 9, March 2, 1840.

secured his rights, I would with pleasure add my evidence, having been one of the first witnesses of its success. But I think that M. Lassaigne has not presented any impression caused by radiation in the camera obscura, though he has endeavoured to obtain some with apparatus indeed imperfect. MM. Bayard and Verignon having presented such, it must be presumed that they have discovered some circumstance peculiarly efficacious to ensure success. According to what they have announced, this circumstance would consist in the state of humidity of the paper impregnated with iodine, and in the preservation of this state while the radiation is acting.

COPIES OF STATUES, EXECUTED BY M. DUTEIL'S MACHINE.*

M. Arago presented to the Academy of Sciences, at its sitting of the 9th of March, in the name of M. Duteil, two copies of the same statue executed by means of the machine mentioned in the sitting of the 24th of February, one of which copies was in the state in which the machine left it, and the other was finished by the sculptor. M. Arago observed that the sketch given by the machine had been executed in 24 days, requiring only the attention of a young apprentice, while to obtain a similar one, by the ordinary means, would have occupied a practitioner three months.

ON A PHOTOGENIC PAPER FOR COPYING DRAWINGS AND ENGRAVINGS.†

BY M. E. BECQUEREL.

Soon after the discovery of MM. Niépce and Daguerre, several photogenic papers were investigated; to my knowledge but two or three of them give drawings in the natural direction, that is to say, representing shades by shades and lights by lights. M. Bayard has formed one of these papers, and in a recent sitting of the Academy, he has explained the process by which he some time since copied the drawings of the camera obscura. The preparation of this paper requires the use of nitrate of silver.

Some months ago, M. Ponton made known a sensitive paper (see *The Chemist*, No. III., 2nd edition, page 73); it was prepared by steeping a sheet of paper in a solution of bichromate of potassa, drying it and exposing it to the light; the action of the chromic acid on the paper is such that the parts exposed to radiation gradually become orange-coloured; afterwards, if the paper be dipped in water, all the bichromate which had not been exposed to the solar action is dissolved, and there is printed on the paper those parts only which have been exposed to the light. With this paper, M. Ponton has copied engravings with advantage. There is thus obtained a faint representation of objects, shades being represented by lights, and *vice versâ*, as with papers of chloride or bromide of silver. In studying the action of chromic acid on organic matters under the influence of the sun, with which action I am at this time occupied, I have been led to continue M. Ponton's process, and I have been enabled to produce a new paper capable of representing in the drawing produced by the action of the solar radiation, shades by shades, and lights by lights, and of giving, not only another tint to it, but even more vigour. It is sufficient to steep a paper prepared in M. Ponton's manner, and upon which there exists a faint copy of a drawing, in a solution of iodine in alcohol, to wash this paper in water, and then dry it; then the parts which were white become blue, and those which were yellow remain more or less clear.

The following is a detail and an explanation of this process: having employed various kinds of paper impregnated with the bichromate of potassa, I discovered that they were not all apt to produce drawings rapidly; that the mode of sizing influenced their coloration by light, and that with unsized paper coloration was effected after a long time; whence I perceived that the principal reaction resulted from the chromic acid contained in the bichromate on the starch in the size of the paper; then, as starch has the property of forming with iodine a combination of a very fine blue colour, I thought that on those parts of the paper which had not been exposed to the action of the solar rays, the starch not being combined with chromic acid, iodine ought to form the blue iodide, and thus represent shades by shades.

When it is wished, by means of this process, to copy an engraving, the method which I have followed should be adopted: it should first be ascertained that the paper is well sized, and that the starch is spread uniformly over its surface; for that it is steeped in a weak alcoholic solution of iodine, then washed in a great quantity of water; by this second immersion, it should take a fine blue tint, which the first did not give. If this tint is uniform the paper is considered fit for the experiment; in the contrary case it should be again sized. Common paper suits better for this object than any other.

It is afterwards steeped, according to M.

* *Comptes Rendus*, No. 10, March 9, 1840.

† Academy of Sciences, sitting of the 16th of March, *Comptes Rendus*, No. 11.

Ponton's direction, in a concentrated solution of bichromate of potassa; then, in order that the paper may be stained more uniformly, after a few moments' immersion it is compressed strongly between sheets of blotting paper, and dried either by leaving it in the blotting paper in the dark, or by putting it near the fire. To be effective, it should be very dry. When it is thus impregnated with bichromate of potassa, it is placed on a plate, then covered with the engraving to be copied, taking care that the side of the drawing be applied to the paper, and with a glass plate fitted in a screw press, they are pressed against one another, and thus exposed to the solar rays. At the expiration of a time varying from thirty seconds to fifteen minutes according to the thickness of the paper of the engraving, the drawing is very distinct (in diffused light a longer time is necessary). The engraving is removed, the paper washed and dried. When dry, it is steeped in a weak alcoholic solution of iodine, and afterwards, when it has remained in it some time, it is washed in water and carefully dried in blotting paper, but not at the fire, for at a little before 100° the combination of iodine and starch discolors. If it be considered that the drawing is not sufficiently distinct this immersion may be repeated several times; by this means may be obtained the intensity of tone which is desired to be given to the drawing, which intensity cannot be changed at will by employing a more concentrated solution of iodine.

When the paper is damp, the shades are of a very fine blue, but when it is dry the colour becomes deep violet. I have discovered that when it is still wet, if it be covered with a layer of gum arabic, the colour of the drawing is greatly preserved, and more beautiful when it is dry. When a paper is thus prepared, at first it loses a little of its tone, but it afterwards preserves its violet tint.

By means of this process engravings and drawings may be faithfully copied, and that at a very low price, for the process is very cheap and of easy execution. However, the vigour of the drawing produced is not as great as that of the engraving, but it has not so much dryness. The demi-tints are faithfully copied.

The Academy will be able to judge of the correctness of the facts from the impressions which I have the honour to exhibit to them, and which are only the first productions of a process which has yet to be perfected.

The experiments which I have tried in copying images of the camera obscura by means of this paper, not having yet given satisfactory results, I will not trouble the Academy with them.

ON AN APPARATUS FOR DRAWING MICROSCOPIC OBJECTS, AND BY MEANS OF WHICH THE PHOTOGRAPHICAL REPRESENTATION OF THOSE OBJECTS MAY BE OBTAINED.*

BY M. LEFEBVRE.

An apparatus with which the figure, whether of the natural size, or more or less magnified, of an opaque or transparent body, may be copied on the surface of ground glass or glazed paper, so that an object may be copied in all its details from nature itself, was invented five or six years ago by M. A. Percheron and myself, made by M. C. Chevallier, presented by me to the Entomological Society of France, at its sitting of the 6th of April, 1836, mentioned by M. C. Chevallier in his last pamphlet, made known under the name of Megagraph, and employed with success by several entomologists.

To substitute for the ground glass which receives the image, an iodized plate, was therefore the only operation necessary to obtain the drawing by it.

Before the publicity given to the Daguerréotype, M. Lerebours and myself had obtained results similar to those which M. Donné has since published, and which he says he obtained with an apparatus the idea of which had been suggested by M. Doyere; for which apparatus, as it is founded absolutely on the same principles as that which we made known several years ago, the priority of invention cannot be disputed to us.

As to the applications to photography, if we have delayed presenting the products we have obtained, it is because we have awaited some slight improvements intended to render this operation still more easy and certain; it occupies from three to ten minutes. We have now the honour of exhibiting to the Academy some of the first drawings obtained by means of the Megagraph, in order that they may be compared with those of M. Donné.

* Academy of Sciences, sitting of the 16th of March; *Comptes Rendus*, No. 11.

III. PHARMACY, &c.

ON STIBIAL TARTAR.†

BY M. ORFILA.

M. Orfila read a very interesting memoir on stibial tartar, and the means of detecting its presence in animal organs.

It results from his experiments:—

1st. That stibial tartar introduced into the stomach or applied to the subcutaneous cellular tissue of living dogs is absorbed and carried into all the organs of the animal economy, as M. Magendie had announced, without demonstration.

2d. That when it is put in fine powder upon the subcutaneous cellular tissue of the internal part of the thigh, two grains were sufficient to cause death in small dogs at the expiration of 30 or 40 hours.

3d. That it is possible by means of certain chemical processes to extract metallic antimony from the portion of stibial tartar which has been absorbed.

4th. That it becomes indispensable to recur to this extraction when the poison has not been found in the digestive canal or upon the other parts to which it had been directly applied, or in the matter vomited; for in seeking stibial tartar in the stomach and intestines merely, so much the more risk is run of not discovering it, as it is very easily vomited, while the metal of one part, at least, may always be obtained from the absorbed portion.

5th. That a medico-legal report should be declared incomplete and insufficient, if, *in the case indicated*, the search for stibial tartar in the tissues, where it may be found after having been absorbed, has been omitted.

6th. That among the viscera of the animal economy, the secretive organs and particularly the liver and kidneys, contain much more of it than the others, which is evidently because the blood stays longer in the former than the latter.

7th. That if it is decomposed by the blood and by the organs, this decomposition is not complete, since, in treating these organs by boiling water, a liquid very sensibly antimonial, is obtained; indeed, it would not be impossible that the tartaric acid alone should be decomposed and the stibial tartar reduced to hypo-antimonite of potassa which is soluble in boiling water.

8th. That this poison may be detected by treating, in a suitable manner, one of the viscera of the animal economy previously dried, especially when this viscus is an organ of secretion; but that it is preferable to operate on several of them at once, in order to procure a greater quantity of metallic antimony and to recognise it more easily.

9th. That it might however happen in a medico-legal investigation, that no trace of this metal might be extracted by analysing the viscera alone or together, because the emetic remains only a certain time in them, and it might have already left them in order to combine with the fluids secreted; but a considerable proportion of antimony may always be obtained by acting in a proper manner on these fluids, and especially on urine.

10th. That if it be true, that arsenious acid acts, in this respect, like emetic, that is to say, that it escapes first from the blood, then from the viscera, to mix with the secreted liquids; this effect does not, however, take place by any means so rapidly as with stibial tartar, and this explains why there is often found in the blood and viscera a portion of the absorbed arsenic. That it might happen, however, if death occurred only at the end of a few days, that the arsenical poison might exist only in the urine and the other secreted liquids, in which the medical investigator would necessarily be obliged to seek them.

11th. That the process to be followed, for the extraction of the metallic antimony contained in the portion of stibial tartar absorbed, consists in carbonising the dried viscera by pure concentrated nitric acid, in a porcelain capsule, as I have directed in my memoir on arsenic, in boiling the carbon obtained, for half an hour, with hydrochloric acid mixed with a few drops of nitric acid, in filtering the liquid and in introducing it into a Marsh's apparatus: there will soon be disengaged antimoniuretted hydrogen gas, which being inflamed will deposit great part of the metal which it contains, upon a porcelain plate. During the carbonisation, the tartaric acid is entirely decomposed, and everything leads us to believe that the protoxide of antimony passes to the state of antimonious acid soluble in hydrochloric acid, while the potassa of the stibial tartar combines with the nitric acid, of which a slight excess is always found in the carbon.

12th. That this same process, wrongfully claimed by M. Couerbe, since I pointed it out in 1832, in my "Traité de Medicine Legale," ought to be preferred to all those which are known for discovering an antimonial preparation, insoluble in water, and combined with the alimentary or solid excremental matters which might exist in the digestive

† Royal Academy of Medicine, sitting of the 10th of March, from *L'Esculape*, March 12, 1840.

canal, or which made part of the solid matter vomited, in a case of poisoning by emetic.

13th. That the extraction of metallic antimony from the viscera or from the urine of the bodies of individuals who had not submitted to medical treatment by a stibial preparation, proves incontestably that there has been poisoning, since neither the viscera nor the urine of these individuals, treated in the same manner, furnish any trace of antimony.

I will not conclude, says M. Orfila, without drawing the attention of the Academy to a point of this work which is not uninteresting. If the recent experiments of Blacke establish that certain very active vegetable poisons are absorbed and carried into all the organs *in a few seconds*, which M. Magendie had already observed as regards phosphorus, it results from mine that stibial tartar, after its absorption, does not remain long in the blood, or at least that there is not enough of it there, an hour after poisoning, to be detected by Marsh's apparatus. Arsenious acid also leaves the blood at the expiration of a certain time, but much more slowly than emetic: thus, I have not found it in the blood of dogs poisoned 22 hours previously, while I have recognised its presence at the end of three hours in the same animals, and after 13 hours in Soufflard, and the lady whom M. Casimir Broussais attended. The patient of the *Rue de Richelieu* has also yielded some traces several days after poisoning; however, I dare not affirm in the face of my new researches, that the atom of arsenic extracted from the blood of that individual did not arise from a small proportion of arsenious acid which might not have been expelled from the digestive canal by vomiting and stool, and which, having thus remained a long time in this canal, had been ultimately absorbed. Be this as it may, it is curious to see emetic and arsenious acid after having been given up by the blood and deposited in the various tissues of the animal economy, remain a much longer time and in much greater proportion in the secretory organs than in the others, before being eliminated from these viscera to be mixed with the secreted liquids; but what appears to me more important, as a physiological fact, as I will show hereafter, is the remarkable difference which these two poisons present, and they will no doubt present many others, with respect to the time during which each of them is retained by our organs.

OBSERVATIONS CONCERNING THE CEREBRAL SUBSTANCE OF A FŒTUS.*

BY M. FELIX BOUDET.

In 1821, Madeline Regnault, afterwards Martin, then 28 years of age, became pregnant, and her pregnancy went through all its periods in the most regular manner. At the presumed time of delivery, she was seized with pains completely similar to those which a woman in labour experiences, but she was not delivered; the pains ceased at the end of three months, and MM. Dubois and Boyer, whom she then consulted, detected an extra-uterine pregnancy. In the month of May last, that is to say, 18 years afterwards, she died of strangulated hernia. A *post mortem* examination was made by M. Thivet, member of the Anatomical Society, who, having opened her, found a child fixed to the viscera by very loose membranous attachments. On examining this fœtus, there was discovered above the membranes of the secundine, a demi-ossified crust formed almost exclusively of calcareous salts. This crust enveloped the whole of the fœtus, round which it formed a shell of at least three millimetres in thickness. Under this shell the skin was found perfectly preserved throughout, soft, flexible, very elastic, and in some places of a pinkish colour. Between the bones of the cranium and the dura mater there was found, here and there, masses of a matter analogous in appearance to congealed olive oil. In the cavity of the cranium not a trace of cerebral substance was found, but a fat similar to that which had been found between the bones of the cranium and the dura mater. The whole of the fat was estimated at 75 grammes; the small quantity which was sent to me had a buttery consistence, a granular aspect, melted with the heat of the hand, reddened turnsole paper slightly, and had the appearance of human fat. Heated in a silver spoon, comparatively with this matter, it distilled rapidly, spreading the same odour, and left, like it, but a slight residue of carbon, without any traces of alkali. Besides, it was composed of a solid part, and of an oily liquid analogous to oleine. The solid part, freed from the oleine by gentle pressure between two sheets of blotting-paper, and treated several times with boiling alcohol, was partially dissolved in it, at each treatment.

I saponified separately the matter which had been dissolved and that which had not, and their soaps, when decomposed, yielded each a fat acid which was very soluble in alcohol, crystallizable, fusible at 60°

* *Journal de Pharmacie*, March, 1840.

centig., and endowed with the properties which appertain to margaric acid. Besides the neutral fats which had furnished this acid, although the small quantity which I had at my disposal did not allow of my freeing them from oleine, had fusibility much resembling that which M. Pelouze and myself have attributed to margarine. The substance, therefore, which I have examined, should be considered as a mixture of oleine and margarine, identical with the human fat; I should add, however, that it appeared to me to contain a small quantity of the white fatty matter first observed in the brain by Vauquelin, and for which M. Couerbe has proposed the name of cerebrote. Our present knowledge concerning the constitution of the cerebral substance will not permit me to explain the curious fact which I have just mentioned: it is to be hoped, however, that the recent experiments of M. Frémy, (see the *Chemist*, No. III., page 79,) which tend to make us regard this substance as essentially formed of two saponified fats, will lead one day to the discovery of some relations between it and the fatty matter of the human body.

POISONING BY NIGHTSHADE BERRIES. (SOLANUM NIGRUM).*

Black nightshade has long been considered as a narcotic plant, and its berries as very poisonous, having caused the death of children who had eaten them in mistake for currants. M. Dunal of Montpellier thinks that in this case it is not the berries of the black nightshade which produce these deleterious effects, but the fruit of the belladonna. He has expressed this opinion in consequence of some experiments which he has tried on himself, and on animals, and which lead him to think that this plant is by no means dangerous. M. Guillemin (*Dictionnaire des Drogues*) also says that the leaves and fruit of black nightshade are far from possessing all the narcotic properties attributed to them. However, M. Desfosses has found solanine in the juice, which alone ought to make us very careful. In corroboration of this we may refer to a work of M. Bourgoyne, physician at Condé, published in the *Journal de Chimie Médicale*, 1827, relative to the deleterious effects of this plant on sheep. As the opinion establishing the deleterious effects of black nightshade berries may become the source of serious accidents, we give the following observations which M. Pihan Dufeyllay has lately published in the *Journal Académique* of the Lower Loire.

Three children, residing in a village near Nantes, went out on the 27th of August, 1838, to play: they returned at night, asking for water to quench their thirst, and went to bed without desiring any supper: in the middle of the night, the eldest of these children, aged nine years, who sat up, complained before going out of a slight pain in his head, uttering groans caused by a violent cephalalgia; he complained of nausea and colic, making efforts to go to stool, but being unable to do so. There soon came on copious vomitings of mucous matters at first, then of a thick, blackish green liquid: the pupils were extremely dilated; he scarcely distinguished the surrounding objects; his face was distorted, and a copious perspiration ran all over his body; his thirst was unquenchable, and he complained perpetually of a violent head-ache; he soon became speechless, respiration became stertorous, the body was seized with tetanic symptoms, and the child died at two o'clock in the morning, before assistance could be procured.

While this child was sinking, his brother, aged five years, began to complain of vertigo, nausea, and colic; like him he vomited alimentary matters, then a blackish green liquid. It was next day, the 28th, that M. Pihan Dufeyllay was called in to him, assisted by Dr. Morisson. These physicians found the little patient lying on his back, in a prostration, now and then interrupted by convulsive movements. The face was swelled and distorted, the pupils alternately dilated and contracted, the skin burning and covered with perspiration, the pulse frequent, and rather irregular: thirst was very keen, but liquids were instantly rejected by vomiting. Leeches were immediately applied behind the ears. At night the symptoms were more serious; the coma was more profound. Leeches were applied to the legs. Next day, the 29th, the coma, the convulsive agitation, and the plaintive cries continued. More leeches were applied to the ears, and a purgative was ordered which was rejected immediately; then blisters were put on the legs, and frictions were made with Neapolitan ointment, behind the ears and on the lateral parts of the neck, half a drachm every half hour.

In the mean time the sister of these, aged three years, was seized with exactly similar symptoms. It was then that, struck with the similarity of the symptoms in three persons of the same family, the physicians suspected an identical cause. After numerous questions, they learnt from a child in the neighbourhood, that the two eldest had gathered and eaten abundantly a kind of fruit, and that they had given some to their sister: this fruit, as described to them, was that of the *solanum nigrum*, or black night-

* *L'Esculape*, March 7th, 1840.

shade; the poisoning was evident. Under the influence of energetic treatment, the symptoms were dissipated; but under a too rapid alimentary regimen, these children suffered relapse, and fell into a long and dangerous illness.

These observations appear to us so much the more worthy of interest as they tend to fix the opinion of physicians concerning the poisonous properties of a plant, whose leaves, when boiled, are eaten in some countries as food.

ON GARLIC (ALLIUM CEPA).*

It is known that garlic, much used as a condiment, particularly in southern regions, has also been employed medicinally; 1st, as a prophylactic; 2d, as a vesicant; 3d, as a resolvent; 4th, as a vermifuge; 5th, as a diuretic; 6th, against gravel and stone; 7th, against dropsy; 8th, against intermittent fevers; 9th, against hemorrhoids, &c.

A practitioner, in one of the sittings of a medical society, has called the attention of physicians to this vegetable: he has thus given his conclusions:—

1st. The use of this substance may render real service in medicine to the poor and country people.

2d. The local or physico-chemical action of garlic is incontestably irritant, but it should not be confounded with the dynamic action which depends on the absorption of the volatile oil that its substance contains, and which may be of an opposite nature.

3d. The dynamic or constitutional action of garlic seems analogous to that of squills, and it may probably be employed as an antiphlogistic remedy in many diseases.

4th. It is very probable that, administered in a large dose, garlic acts as a cold or asthenic poison, and that its effects demand the use of stimulant remedies; but science being deficient in facts on this subject, we can only express the wish that experiments be made on animals.

These conclusions have given rise to objections on the part of MM. Bourjot-Saint-Hilaire, Bricheteau, Gilette, and Nonat.

All these objections, which we need not relate, show that garlic deserves to be made the subject of investigations, with the view of ascertaining, 1st, its chemical composition; 2d, its therapeutical properties; 3d, its toxical effects on the animal economy.

We may also say that garlic is not altogether abandoned, and that we know medicines of which it is an ingredient; such are:—

1st. The pills (*antiglaireuses*) described in the formulary of Bories, and in Pierquin, *Memorial Pharmaceutique*.

2d. The anti-hemorrhoidal kind mentioned in the pharmacology of Paris.

3d. The hemorrhoïdal fomentation described in *Dispensaire Medico-pharmaceutique du Palatinat*.

4th. The syrup of garlic in different dispensaries.

5th. The hydragogue apozem, formulary of Bories.

6th. The vinegar of garlic.

7th. The oximel of garlic of the pharmacopœia printed at Wurzbourg, *Pharmacopœia Herbipolitana*.

8th. Antiseptic vinegar.

9th. Finally, compound antiseptic vinegar (formulary of Bories).

* *L'Esculape*, March 7th, 1840.

SUBSTITUTE FOR JALAP.†

The seeds of the *Ipomea cærulea*, the kaladana, or mirahai of the Indian bazars, one of the Convolvulaceæ, which grows abundantly in every hedge and jungle in Bengal, when reduced to powder, and given in doses of from twenty to thirty grains, purges freely, without griping, in from two to three hours. It has been extensively tried in the Native and Police Hospitals of Calcutta, and has been in every case found superior to jalap; inasmuch as it is nearly tasteless, and operates freely, without producing the griping which jalap almost invariably occasions.

THE CEYLON MOSS.

This plant has long been employed in India in the preparation of a very nourishing jelly. It contains more nutritive gelatinous matter than either Iceland or Carageen moss, and it is quite without their disagreeable taste. The superiority of the jelly made from this moss consists in its suitableness to very delicate stomachs, being more easy of digestion than the mildest animal jelly.

EXAMINATION OF AN ANIMAL TINCTORIAL POWDER, CALLED SYRIA.‡

BY M. J. J. VIREY.

There is imported from London a powder of a very deep violet-reddish brown, very heavy, inodorous and insipid, but tinging the saliva a beautiful carmine red. This powder is dense and rather volatile; it communicates either to water or alcohol a fine deep solid purple tint. Nitric and acetic acids, &c., give it an orange or rather yellow tint, which resumes, however, in the air a more violet aspect. The alkalies turn the colour to bluish purple.

† *Quarterly Journal of the Calcutta Medical and Physical Society*, July, 1838.

‡ *Journal de Pharmacie*, March, 1840.

It was first necessary to know the nature of this product: placed on a red-hot iron plate, it gave white thick vapours, of an animal nature, and left only a turgid carbon, difficult to incinerate. This character thus manifested the essentially animal nature of the powder.

It was then desirable to discover in what order of animal substances might be found the origin of this powder staining of a carmine red.

We have thought, therefore, that as there is collected more particularly in the East, Asia Minor, or the Levant, a great quantity of animal kermes, *coccus ilicis*, we were at first contented to express from it the purple juice so rich in the coccine of Lassaigne, which is analogous to the carmine of Pelletier, extracted from cochineal. But it is known that after expressing the juice of kermes employed as a dye, or for syrups, exciting liquors much used in the East (altermes, &c.), the residues, the remains of these insects containing the semi-horny cover, and the other organs dried in balls, remain abandoned as almost useless. The greater portion of these residues, indeed, is composed of the horny substance, common to most insects, and called *chitine*, with some mineral salts (phosphate and carbonate of lime) which ordinarily accompany it.

But it was easy to ascertain that these remains still retained a considerable quantity of coccine, the red colouring matter.

It is, therefore, sufficient to pulverize these dried residues of the kermes, and in order to give an Oriental name to this matter with a view to enhance its value, it has been disguised under the name of *Syria*,* or Syrian powder.

It is evident that a very great quantity of purple colouring matter, and a more or less solid tincture may be obtained from this powder, but we have not remarked whether these are such lively, brilliant and pure tints as the carmine of cochineal presents in its most beautiful preparations; however, it is probable that syria will be found very useful in dyeing, and for colouring paper, tissues, and a number of objects in daily use.

ADDITIONAL NOTE.

In might be suspected that lac-lake or lac-dye might contribute to the formation of this tinctorial powder, because both afford a purple colour. But the samples of lac-dye, in cubic violet-red brown lumps, such as we have described in the *Journal de Pharmacie* for 1821, vol. vii. page 523-4, at the conclusion of our memoir on lac-resin, are not completely incinerable in the fire like *syria*. Moreover, lac-dye contains also a portion of friable magnesian talc, which has received the colour in such a manner that it may be used as a water-colour, which is by no means the case with syria; it does not yield earthy matter, nor does it effervesce with acids, according to my experiments. It has, nevertheless, a greater specific gravity than lac-dye, for the latter retains a portion of the resin of the lac in the caseum of milk, with the assistance of soda, afterwards precipitated by citric acid. On the contrary, syria, equally soluble, as regards its tinctorial part, in water and alcohol, does not contain so much resin as lac, or even as lac-dye.†

Such are, therefore, the differences between these tinctorial matters.

* It should be called *Pulvis Syrius*.

NEW SUBSTITUTE FOR SULPHATE OF QUININE.‡

We read in a journal the following article:—*New substitute for sulphate of quinine.* M. Rigatelli assures us that he has discovered an indigenous substance which may advantageously be used for sulphate of quinine: he calls this substunce *salino amarissimo antifebrile*. A commission, named by the Academy of Verona to make a chemical and therapeutical examination of the medicine, has found that this saline substance is derived from the indigenous vegetable kingdom, as spread over Europe; that it is obtained by a simple process and in considerable quantity; that it is composed of an acid in combination with a vegetable alkali, and that it does not contain any thing prejudicial to health. The salt is friable, of an earthy appearance, of a brick-red colour, and of a more astringent and bitter taste than sulphate of quinine; the little smell it has is herbaceous. Powdered, this substance turns white and becomes very soluble in water; numerous observations have proved that it may advantageously be substituted for sulphate of quinine, in all cases wherein the latter is recommended.—(*Litt. ann. den Heilkunde.*)

† Cochineal, *coccus cacti*, animal kermes, *coccusilicis*, the shell-lac insect, *coccus lacca*, of Kerr, are three animals of the same species, frequenting vegetables with more or less red juices, with which they are nourished. However, they furnish much more beautiful purple colours than can be extracted from those plants. It is the same with the cochineal of Poland (*coccus scleranthi*), but the cochineals of the fig, of the orange and olive-trees, &c., do not furnish these rich dyes, perhaps because they do not exist in the *latex* or juices proper to those trees.

‡ *L'Esculape*, March 7th, 1840.

We had wished that the article on the discovery of M. Rigatelli were more explicit, and that it had informed us in a positive manner what this discovery of M. Rigatelli is, a discovery of which the date extends as far back at least as 1821, and which has remained unknown since that time. To give here a proof of what we advance, we may quote an article extracted in 1826 by M. Olivier, of Augers, from the *Journal Atti dell' Academia d' Agricultura, Commercio, ed arti di Verona* :—

"New salt, whose properties equal those of sulphate of quinine, discovered by M. Bart. Rigatelli."*

The plant which has furnished M. Rigatelli with the new salt of which he announces the discovery, grows in the environs of Verona, and for four years many distinguished practitioners have proved the advantageous effects of this medicine, having employed it frequently and successfully in circumstances wherein quinquina is recommended. Particular motives oblige M. Rigatelli to conceal for a time (1826), the name of the plant which yields this new febrifuge; he wished, nevertheless, to submit the subject of his discovery to the Academy of Verona, the members of the commission being besides engaged to keep the secret for a certain time. The conclusions which the commission has published are as follows:—

1st. The vegetable which furnishes the new salt is *very common*, not only in the States of Verona, and the Lombardo-Venetian kingdom, but even throughout Europe.

2nd. This salt is obtained by a very simple process, in considerable quantities, relatively to those of the vegetable employed; the expences are nothing compared with those which the preparation of sulphate of quinine requires.

3rd. This matter does not contain any principle which can exercise an injurious action on the animal economy, and consists in the combination of a liquid with a vegetable salifiable principle.

4th. Not powdered, this new salt has a brick-red colour, a friable consistence, a taste much more bitter than that of a sulphate of quinine, slightly astringent, and of scarcely perceptible herbaceous odour.

5th. Reduced to powder, the characters of this salt are the same, but it dissolves rapidly in water, and acquires a whitish colour.

6th. There is a great resemblance between this salt and sulphate of quinine, the bitterness of which is much less decided; from its advantageous and well-attested effects in certain fevers, it results that it is possessed of the same properties as sulphate of quinine, and that it may be employed with equal success in all cases which demand the exhibition of quinquina or quinine.

7th. Lastly, its very moderate price should make its use generally preferred to that of sulphate of quinine, especially in hospitals and almshouses.

* It appears that M. Rigatelli has not imitated the generous example given by MM. Pelletier and Caventou, who, preferring fame to fortune, have not sought to appropriate to themselves immense sums which they might have obtained, either by keeping secret their process of extraction, or by taking out a patent which would have procured them a monopoly: the example of MM. Pelletier and Caventou has been followed in France by many chemists.

OBSERVATIONS ON SNAILS.†

BY OSCAR FIGUIER.

It is generally believed that the medicinal properties of snails are owing to a mucous and mucilaginous body, which the flesh of these molluscæ contain in abundance; we are obliged, in pharmaceutical operations connected with snails, to preserve this mucous principle especially, and to eliminate the others. Now, the preparations made with this view are inefficient, or derive their properties only from the principles associated with them; while the clinical experiments of M. Chrestien and other practitioners of Montpellier, testify that few agents are so useful, in affections of the chest, as snails, taken whole and without other preparation.

The experiments of M. Figuier related to the officinal snail (*Helix pomatia*). To separate the mucus from the snail, he availed himself of the process of M. Mouchon, which consists in beating up the flesh of snails cut in pieces, in three times its weight of water, with a sprig of willow; it is then evaporated on a stove. He obtains a dry matter, of a yellowish white colour, which water swells up much without dissolving it. It is insoluble in the acids, and very soluble, on the contrary, in the alkalies.

By treating with ether the flesh of snails thus deprived of the mucilaginous parts, M. Figuier has extracted from it an oily matter, which, according to him, contributes almost solely to the medicinal properties of snails. He has given it the name of helicine, although it is a matter of a very complex nature. Helicine is oily, transparent, of a very slight yellow colour, of a peculiar odour, and of a disagreeable characteristic taste; alcohol dissolves it readily, alkalies

† *Journal de Pharmacie*, February, 1840

saponify it, and acids separate it, endowed with still stronger smell, which seems to announce in helicine a matter analagous to hircine and phocenine. M. Figuier, has discovered sulphur in helicine; it contains 1·4 per cent.; and he draws from this observation the consequence, that helicine, as is the case with many other sulphurous matters, should act in diseases of the chest, and that it ought to be much accounted of in the medicinal effects of the snail; and as he has found only traces of sulphur in the mucus of the animal, he admits that the latter is inert, and that all the effect produced should be referred to helicine; an opinion which will doubtless appear a little exaggerated.

M. Figuier has found in the shell of snails much carbonate of lime, traces of sulphate of lime, phosphate of the same base, and a mucous matter. He has also examined the excrements of these animals, expecting to find uric acid in them, but he has not discovered it. M. Figuier being occupied with pharmaceutical preparations of which snails are the base, contests the opinion put forth by M. Mouchon, and urges the necessity of submitting the snails to fasting before administering them; he quotes on this occasion the following observations, which are but little known. M. Reussi saw in Milan a case of poisoning, caused by three snails, taken in a ditch in which grew hemlock and belladonna (*Ann. Clin. de Montpellier*, No. 171); moreover, M. Gaspard relates, according to M. Guillaume (*J. de Physiol.* No. 1), that during the scarcity of 1817, when individuals fed on snails, those who did so to excess, presented a state of stupor and narcotism, which certainly ought to be attributed to the peculiar nourishment of these animals. Experience has proved, on the contrary, that at the end of a month's abstinence, snails have never offered any inconvenience when used as food.

M. Figuier admits, as a principle, that pharmaceutical operations should tend to introduce all helicine in the preparations, to avoid the employment of a high temperature, which would alter the sulphurous principle. To that end, he introduces all the substance of the body of the snails into the preparations, and always operates at a temperature which does not exceed 100°.

1 part of flesh ground with 5 parts of sugar, the matter, being dried on the stove, forms the syrup of snails, which, reduced to a paste, by means of a mucilage of gum tragacanth, furnishes losenges. M. Figuier makes a paste of snails analogous to that of marshmallow. It contains one-eighth of snails' flesh. He has also given a formula for chocolate and the syrup, which, in our opinion, he has done wrong to complicate by introducing into it a great quantity of sweet and bitter almonds.

FORMULÆ FOR THE CONCENTRATED TINCTURES OF HAENLE.*

These preparations have been examined by a commission of health, which has ordered it to be printed in the Pharmacopœia of Baden.

This is the *modus faciendi*:—

Substance in very fine powder .. 8 parts.
Alcohol at 32 B ..... 16 parts.

The whole is put into a close vessel to be digested four days at a heat of 16° or 18° Reau., taking care to stir it occasionally; it is afterwards pressed and filtered; to the residue is added as much alcohol as the powder has absorbed; it is again pressed and filtered; the two liquors are united; the total weight ought to be 16 parts, that is, double that of the powder employed. In this manner may be prepared:—

TINCTURE OF ACONITE.

Which is of a dark brownish green, at 14° Reau. Its specific gravity is 0·860. By the addition of water, this liquid becomes turbid, and takes a yellow colour.

TINCTURE OF ARNICA FLOWERS.

Colour brownish yellow, strong odour of arnica; specific gravity, 0·860. Gives a yellow colour to water.

TINCTURE OF BELLADONNA.

Colour, greenish black; odour, narcotic; specific gravity, 0·846. It turns water of a greenish yellow, but more green than that of aconite.

TINCTURE OF CHAMOMILE FLOWERS.

Colour, reddish brown; saturated, it has a strong odour of chamomile; specific gravity, 0·867. It imparts to water a brownish-white colour.

TINCTURE OF CICUTA.

When saturated it has a blackish-green colour; odour, that of cicuta; its specific gravity is about 0·863. It has the same effect on water as that of belladonna.

PURPLE TINCTURE OF DIGITALIS.

Saturated, colour, blackish green; very little smell; specific gravity, 0·869. It scarcely troubles water, but the colour is greenish yellow.

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* *Journal de Chimie Médicale*, March, 1840.

TINCTURE OF HYOSCYAMUS.

Colour, blackish green; the narcotic smell of hyoscyamus; specific gravity, 0·855. It has the same effect as that of belladonna on water.

TINCTURE OF IPECACUANHA.

Colour, brownish yellow; specific gravity, 0·855. Causes water to become whitish.

TINCTURE OF PEPPERMINT.

Saturated, colour, blackish green; odour, that of peppermint; specific gravity 0·863. Turns water green.

TINCTURE OF SAVINE.

Colour, blackish green; odour, that of savine; specific gravity, 0·876. It colours water yellowish green.

TINCTURE OF SERPENTARIA.

Colour, reddish brown; the peculiar odour of serpentaria; an aromatic taste resembling camphor: specific gravity, 0·858. It turns water yellowish white.

TINCTURE OF VALERIAN.

Of a reddish brown colour; odour, that of valerian; specific gravity, 0·862. It imparts to water a yellowish-white colour.

PROCESS FOR PREPARING LACTATE OF PROTOXIDE OF IRON.*

BY M. LARADOUR.

M. Laradour extracted lactic acid from whey procured, in the neighbourhood of Paris, at dairies where much cheese is made. This whey, allowed to ferment for a long time under the influence of a high temperature, yields a considerable quantity of lactic acid. Evaporated to a third or a fourth of its bulk, decanted and filtered, it is afterwards saturated with milk of lime, which causes an abundant precipitate, formed in great part of a calcareous phosphate. The filtered solution is afterwards precipitated by oxalic acid; it is to be filtered again, and the liquid concentrated until it acquires a syrupy consistence. Alcohol is then added to precipitate the lactine and the salts. It is filtered, the alcohol is distilled over, and pure lactic acid is obtained. Lactate of protoxide of iron is prepared by digesting with the sand-bath, at a gentle heat, this acid, diluted with iron filings. After six or seven hours' reaction, the liquor should be boiled, filtered, and concentrated; the crystallized salt is then obtained by cooling. The crystals, drained in a funnel and washed with alcohol, should be rapidly dried and shut up from the contact of the air.

This salt, as M. Laradour has shown us, and as we have observed ourselves, by following his process, which is of easy execution and very cheap, is presented under the form of very white crystalline plates, which are but little liable to alteration. It is rather soluble in water, reddens turnsole paper, and possesses the ferruginous taste to a supportable degree; when it is dissolved in water, it is superoxidized and becomes yellow very quickly.

The sparing solubility of lactate of iron has allowed M. Laradour to render his process still more simple by suppressing the purification of the lactic acid with alcohol, and treating it at once by iron filings. The liquor, evaporated in a suitable manner, allows the lactate to crystallize, the foreign salts and the lactine remain in the supernatant liquor, which may be thrown away.

* *Journal de Pharmacie*, March, 1840.

ON THE EMPLOYMENT OF TWO NEW PROCESSES FOR DETECTING AND ISOLATING ARSENIC IN ORGANIC OR INORGANIC MATTERS CONTAINING IT.†

BY M. PERSOZ.

It results from the researches of M. Persoz, that the arsenic contained in an ore or in an organic substance, being previously transformed into an arseniate, may always be isolated and separated by causing the arsenic acid to pass to the state of arsenious acid, whether by sulphurous acid or by chloride of ammonia. This arsenious acid is afterwards converted into a sulphuret of arsenic by means of a hydrosulphuret.

†*Comptes Rendus*, No. 12, March 24, 1840.

TO CORRESPONDENTS.

NOTA BENE.—*All Communications must be addressed, "To the Editor of The Chemist, care of Mr. Hastings, Publisher, 13, Carey-street, Lincoln's Inn Fields, London." All communications received up to the 15th of each month.*

We are unavoidably compelled to defer answering Mr. THOMAS, of Shaftesbury, and Mr. WILSON, until next month.

Mr. BARTLETT'S communication we are also obliged to postpone.

Mr. NEWBERY'S communication, for which we are indebted to him, came too late for insertion this month, but shall appear in our next.

STEWART AND MURRAY, PRINTERS, OLD BAILEY.

THE CHEMIST.

I. CHEMISTRY.

CONTRIBUTIONS TO THE HISTORY OF ALCOHOL, OF PYROXYLIC SPIRIT, AND OF ETHERS.*

BY M. F. KUHLMANN.

My object in this paper is not to devote myself to speculations relative to the chemical constitution of ethers, but to extend the facts which alone, it appears to me, should lead us to found upon immoveable bases, this very important part of our theories.

I have, therefore, made all my experiments without giving them any special direction towards a settled system; and in my equations, I have always employed the formulæ, $C_4 H_{12} O_2$ and $C_2 H_6 O_2$ to designate alcohol and pyroxylic spirit.

I. I have divided my work into five parts.—In the first, I take a general view of the combinations which alcohol and ether form with bodies which have a great affinity for water. After having pointed out the circumstances in which alcohol and ether act the part of water of crystallization, I am led to attribute to these bodies the part of acids or bases when they form compounds which present all the characteristics of a saline matter. It was not without some hesitation that I admitted the existence of alcoholic compounds in which alcohol acts as a base. In the present state of our knowledge concerning the constitution of alcohol, which leads us to look upon this body as a hydrate of ether, I should be led to regard the combinations of alcohol as combinations of ether and water. Without doubt, nothing prevents us from looking upon them thus; but nothing forcibly induces us to do so: and certainly, in examining the question without the preoccupation of our theories concerning the constitution of alcohols and ethers, we shall, without difficulty, admit the existence of alcoholic compounds, however little stability these compounds may present in some circumstances. These are, however, questions which I leave to the sagacity of the authors of the various theories of etherification.

I thought it necessary to admit the existence of alcoholic compounds, because I had to distinguish these bodies from another equally numerous series of compounds, which I obtained directly by the combination of ether with bodies which have a great affinity for water, and whose properties differ essentially from those of alcoholic compounds. Thus, while by the action of water my alcoholic compounds always yielded alcohol, my ethereal compounds always gave ether; while such alcoholic compounds are altered by heat, yielding ether, oil, &c., the corresponding ethereal compounds are volatilized without alteration: of this number are the ethereal compounds formed by perchloride of tin. Other alcoholic compounds are evaporable without alteration, and are transformed into ethereal ones only under the influence of a temperature of about 140° C.: such is the combination of alcohol with fluoride of boron.

That which I here say of alcohol, as regards the combinations into which it enters, is equally applicable to pyroxylic spirit.

I have shown that the basic part belongs not only to alcohol, pyroxylic spirit and sulphuric ether, but that the ethers of the hydratids are in the same conditions. have published the result of some experiments concerning this kind of compounds.

II. In the second part of my work, I devote myself to the action of heat on alcoholic and methylic compounds: first those wherein alcohol and pyroxylic spirit act the part of acids; next, those in which these bodies form the electro-positive element of the compounds.

The combinations of powerful bases with alcohol or pyroxylic spirit never yield ether by the action of heat: their decomposition takes place in general only at a moderate temperature, and the parts of alcohol or pyroxylic spirit which are retained, are de-

* *Journal de Pharmacie*, April, 1840.

composed only towards the temperatures of 250° C., and then give rise to gaseous hydrocarburets, and, in some instances, to an empyreumatic oil.

The combinations of alcohol and certain metallic chlorides always yield ether towards the temperature of 140°, when the combination is submitted to the action of heat with an excess of alcohol: the ether which is then disengaged, is partly sulphuric. When we operate with an excess of etherifying chloride, there is produced only hydrochloric ether, which, in the latter case, may be obtained at the temperature of 85° to 90°. Ether is not always disengaged in the free state: in operating with volatile chlorides, it is often obtained in combination with those chlorides, especially towards the end of the distillations.

By distilling a mixture of 100 parts of perchloride of tin with 53·79 of absolute alcohol, or 2 atoms of perchloride and 3 atoms of alcohol, the greatest proportion of ether is obtained. For perchloride of iron, the best proportion is that of 100 of perchloride, and 57·82 of absolute alcohol; that is to say, two atoms of alcohol, and one atom of perchloride of iron. When greater proportions of alcohol are used, the excess distils without decomposition before etherification takes place.

The presence of a little water may render modifications in the proportions indicated necessary, but does not prevent etherification.

The mixtures of alcohol and perchloride of tin, or anhydrous perchloride of iron, made in proportions which are represented by the formulæ, 2 Sn Cl_4 3 C_4 H_{12} O_2 and Fe. 2 Cl_6, 2 C_4 H_{12} O_2, may be kept for fifteen days, *in vacuo*, without losing any portion of the bodies associated, and without undergoing any alteration.

The constitution of ethereal compounds takes place also in simple proportions, which seem to correspond to those which preside over the formation of alcoholic compounds. By making a mixture of 100 parts of perchloride of tin, and 57·88 of absolute ether, which represents two atoms of ether and one atom of perchloride, and by placing this mixture in the vacuum, at the ordinary temperature, an excess of ether, representing ¼ of the quantity employed, is volatilized; therefore, the formulæ of the compound which remains should be 2 Sn Cl_4, 3 C_4 H_{11} O. By heating this product, *in vacuo*, to 40° or 50°, it distils, and is condensed in the neck of the retort in beautiful brilliant crystals, presenting the form of rhomboidal tables.

Etherification has been produced by the action of heat on the alcoholic compounds of perchloride of antimony, of chloride of zinc, and cloride of aluminium. The latter gives only hydrochloric ether. Chloride of arsenic did not yield any ether. The action of heat on the compounds of alcohol and fluoride of boron gives, at 140°, an ethereal combination which is distilled: before 140°, part of the alcoholic compound is evaporated without alteration. The product in the retort is transformed into an etherial compound yielding ether by its mixture with water. By operating with perchloride of tin, the residue in the retort, after the disengagement of part of the ether, always gives alcohol, by the contact of water. This difference may be attributed to the great volatility of the etherial compound of chloride of tin, which is the reason that this compound escapes in vapour from the time that it is produced, which is not the case with the compound of ether and fluoride of boron, which is not evaporated until towards 140°. The fluoride of silicium does not give rise to the etherification of alcohol.

III. After the etherification of alcohol by the metallic chlorides and fluorides, I proceed to examine the action of these agents on pyroxylic spirit at an elevated temperature. I have said that pyroxylic spirit formed combinations corresponding to those of alcohol. The action of heat on those compounds wherein pyroxylic spirit acts the electro-positive part, presents a great analogy with that which it exerts on the alcoholic compounds. When, in the mixture of pyroxylic spirit and etherifying chloride, the former predominates, there are formed, as is the case with alcohol, two kinds of ether: a peculiar methylic ether, which is condensed at the temperature of 0° C. and remains liquid at the ordinary temperature, and hydro-chloro-methylic ether, which is condensed only at very low temperatures. When the chlorides are in excess the latter ether alone is produced. The temperatures at which the etherification of pyroxylic spirit takes place, are generally lower than those required for etherification of alcohol. These temperatures are from 125° to 150°. The proportion best adapted for producing the etherification by perchloride of tin seems to be that of two atoms of pyroxylic spirit and one atom of the perchloride. The action of the etherifying chlorides on pyroxylic spirit differs from that produced on alcohol, in this respect, that with pyroxylic spirit the mixture is always of a brownish red color, and that, by the addition of water, a matter of a resinous appearance is precipitated, which does not occur with alcohol: indeed, the residues of the distillation always contain a resinous matter, or carbon, and the chlorides are there found reduced to the state of proto-chlorides.

Fluoride of boron transforms pyroxylic spirit into ordinary methylic ether, which is

very difficultly condensable: this ether is never disengaged in an isolated state, but always in combination with fluoride of boron, from which it is separated by water.

Fluoride of silicium does not yield ether with pyroxylic spirit, any more than with alcohol.

IV. The fourth part of my work relates to the action of anhydrous sulphuric acid on absolute alcohol. I have proved that, contrary to the generally admitted opinion, sulphuric acid could also transform absolute alcohol into ether, and I have published the condition in which this transformation takes place.

I have shown that a mixture of two atoms of anhydrous sulphuric acid and one atom of absolute alcohol never yielded ether, but that by employing a mixture constituted of one atom of each, etherification took place at the ordinary temperatures, namely, from 140° to 160°. When a greater quantity of alcohol is employed, the excess is distilled over before etherification: but when the quantity of acid is increased a little, a greater quantity of ether is obtained. The proportions which I have found to yield most ether are those of four atoms of acid and three atoms of absolute alcohol.

Etherification by anhydrous phosphoric acid takes place only very incompletely and by operating with an excess of alcohol.

Anhydrous pyroxylic spirit, when it predominates in the mixture, yields, with anhydrous sulphuric acid, methylic ether.

The simplest way of accounting for etherification, as much in what relates to the chlorides as to the anhydrous acids, consists in assimilating the decomposition of the neutral, or even basic alcoholic compounds, in what concerns the chlorides, to the decomposition of many ammoniacal salts, which, when neutral, pass, by the action of heat, to the state of acid salts, by losing ammonia; with this difference, however, that when alcohol is displaced at the temperature of 140 or 150°, it is converted into ether and water. The water is partly retained by the acids, and may even be entirely decomposed by the etherifying chlorides, giving rise to hydrochloric acid and to oxide.* This mode of viewing the phenomenon of etherification easily explains how sulphuric acid can transform into ether and water an almost unlimited quantity of alcohol of proper density, added gradually to the etherifying mixture; it is not necessary to have the intervention of an occult force, as MM. Mitscherlich and Berzelius have proposed.

In considering etherification by the hydrated acid as the result of the decomposition of a bisulphate of alcohol, or ether and water (sulphovinic acid), the reaction is again accounted for by attributing basic properties to the water. Water partakes, indeed, in these reactions, for I have shown that, although two atoms of anhydrous acid do not yield ether with one atom of absolute alcohol on account of the excess of acid, a great quantity of ether is obtained by employing two atoms of hydrated acid.

In all cases of etherification, the decomposition of the alcoholic compounds must take place at the temperature of 130° or 140°. I have given evidence of this fact in the last part of my work.

V. I have shown that when we distil *in vacuo*, a mixture of two atoms of hydrated sulphuric acid and one atom of absolute alcohol, which mixture, under ordinary circumstances, yields ether, boiling commences at 50° C., alcohol is distilled over until 104° C., when it passes to the state of oil of wine, and water, without ether.

Analogous results occur with etherifying chlorides: there is not much hydrochloric ether formed: but with these bodies no oil is distilled, even at the temperature of 160° C.

In the reaction by sulphuric acid, the formation of oil of wine without ether, at the temperature of 104°, after a disengagement of alcohol, is worthy of remark: it shows that for etherification in general the temperature of about 140° is absolutely required.

As to the oily carburets, they may be obtained even cold; which is shown by the slow action of fluoride of boron on absolute alcohol.

Among the numerous experiments described in this work, there are, doubtless, many which deserve a more extended examination. Such are the reactions of the anhydrous acids and chlorides on the ethers of the hydracids, and consequently on the organic ethers; the slow action of the etherifying chlorides and fluorides on alcohol. Analytical investigations are also necessary to fix our ideas on different points, especially on the nature of the liquid methylic ether produced by the chlorides; on the crystalline compound obtained by the action of water on the product of the slow decomposition of fluoride of boron by alcohol: it is likewise necessary to investigate the analogy existing between the compounds which I have described and the products designated under the name of the etherial salts of Zeise. It would have been agreeable to me to complete my investigations; but, being prevented by manufacturing occupations from pursuing this work at present, I thought, in the interest of the

* Of the metal formerly combined with chlorine, but which has separated from it that it may form a chloride.—Sub.-Ed. Chemist.

theoretical questions attached to it, that I ought to give them up, however imperfect they may be, to the knowledge of chemists, calling their attention to the various points which are left undecided.

ON THE CHEMICAL POWER OF THE ELECTRIC CURRENT, CONSIDERED IN ITS RELATIONS TO AFFINITIES.*

BY M. BECQUEREL.

I have long devoted myself to investigations, the object of which is to determine accurately the relations existing between the powers which retain heterogeneous atoms united in chemical compounds. From a deficiency of precise means, all my attempts were at first unavailing: but having resumed this subject some time since, I have been fortunate enough to discover a more successful mode of experimenting.

In a binary compound, the power which unites two different atoms to each other varies in its intensity according to temperature, pressure and other causes. Although the nature of this power is not known to us, we have every reason to suppose that it is electric: however, be that as it may, it is very essential to ascertain its intensity, or the degree of energy with which it acts in certain circumstances, when it is compared with another as unity, if we desire to establish a relation between the powers which regulate the combination of one body with two others, that is to say, between the affinities in virtue of which the compounds which result from that combination exist.

Suppose that we were able to lay hold, with exceedingly delicate pincers, of each atom of the combination, and draw them in the opposite direction to their mutual attraction; the power required to overcome that attraction would serve as a measure for it. Instead of an apparatus of this kind, which it is impossible to realise, we have electric currents which, properly employed, are capable of fulfilling the same functions. The principal thing required is to find a means of dividing a current which passes through a solution of two compounds, into two parts, so that each of them may separate one equivalent from another in each compound.

Several principles are required in order to effect this. The first was discovered by Mr. Faraday, and consists in the equivalents of bodies being united, or rather, associated with an equal quantity of electricity; so that the same current which passes into two metallic solutions, operates their decomposition in such a manner that equivalents of each metal are deposited on the metallic plates. This occurs when the two solutions are in separate vessels: but when they are mixed there result compound effects which allow of comparing the affinity of an acid for two different bases. Being unable to detail here the experiments which I have made, on account of their great number, I shall mention only the consequences to which they lead.

By subjecting to the action of the same current, mixed solutions of nitrate of copper and nitrate of lead, of nitrate of copper and nitrate of silver, and of nitrate of lead and nitrate of silver, in equal atomic proportions, it is found that the decomposition is effected in definite proportions, and that in the mixture of the solution of nitrate of silver and nitrate of lead, as well as in that of the solution of nitrate of copper and nitrate of silver, the nitrate of silver only is decomposed, whilst, in the mixture of the solutions of nitrate of lead and nitrate of copper, the nitrate of copper only undergoes decomposition. It is proved, therefore, that the current exerts its decomposing action, in preference, on the nitrate in which the affinities of the oxygen and nitric acid for the metal are least.

If the atomic proportions of the nitrate of copper in the mixture of nitrate of silver and nitrate of copper, be gradually increased, after a time the precipitate ceases to be crystalline; it becomes flaky and tuberculous: its parts are then in such a state of division that it would be very difficult to weigh them. From this molecular state it seems to result, that the mass of nitrate of copper, as it is increased in the solution, exerts an attractive action on the particles of silver, at the moment when they are deposited on the negative plate, and in such a manner as to prevent them from aggregating, or, at least, to prevent the power of cohesion from being exerted.

Very accurate experiments have shown that by operating on a decigramme of nitrate of silver and rather more than 60 equivalents of nitrate of copper, copper begins to appear in the precipitate. By increasing the equivalents of nitrate of copper to 67, the metallic precipitate is then composed of one equivalent of silver and one of copper. According to Mr. Faraday's principle, this result can be obtained only when the current is divided into two perfectly equal parts, since the equivalents of bodies, being associated with equal quantities of electricity, require two currents of the same intensity, to separate them. From this it may be inferred, that the power which unites the oxygen and

* *Academy of Sciences*, sitting of the 4th of May: *Comptes Rendus*, No. 18.

nitric acid to the silver, in the nitrate of that metal, when there is in the solution an atomic part of this compound equal to 0·1g. is the same as that which unites the oxygen and nitric acid, when there are in this solution 67 atomic parts of nitrate of copper. The experiments were made in such a manner that there were produced no secondary compounds capable of changing the atomic proportions of the dissolved salts The influence of masses on the decomposing action of the voltaic current being, therefore, made evident, it was necessary to ascertain if the proportion of the masses, in order to arrive at the division of the current into two equal parts, should not change, when the absolute quantity of the atomic part of the nitrate of silver is increased; that is to say, by increasing it gradually from 0·1g. to 0·5g. and 1g. The results have proved, as might be expected, that the proportion of the masses was no longer the same.

By diluting the solutions with water, the influence of the masses is, of course, diminished.

I regret that I am unable to give here the numerous results and the accompanying disquisition, which are given in my Memoir, in order to afford better evidence of the influence of masses on the electro-chemical action of the current, so as to compel it to separate at the same time two equivalents from two different bases. When the quantity of nitrate of copper in the solution is considerable, not only are the above-described effects observed, but there may also be seen in this solution, when it is lighted by the direct rays of the sun, a considerable quantity of small metallic parcels in motion, which seem to indicate, in some measure, the mode in which the particles are transported by the voltaic action.

When the separation of the two equivalents is effected, the power which unites the oxygen and nitric acid to an equivalent of silver, and that which unites the same bodies to an equivalent of copper, being overcome by the same current, must be considered equal; for two equal forces acting simultaneously and in a continued manner, and producing similar effects, are deemed to destroy equal resistances. Hence it cannot but be inferred, that those affinities are equal.

The influence of masses in the present circumstances may be considered thus: in a mixture of two salts, of two metallic nitrates for example, if we increase the number of equivalents of that whose parts are combined by virtue of the strongest affinities, the action of the current on the other nitrate is weakened, so that at a certain time the action of this current is sufficient to overcome the affinities which combine the oxygen and nitric acid to an equivalent of each of the two metals. In what manner does the increase of the masses produce a similar effect? It cannot be conceived that by admitting that, in proportion as nitrate of copper is added to the solution, the particles of this nitrate are again aggregated, which shows increase as much as the action which the current exerts on them. Now, as the action of the current is definite, it follows that that which it exercises on the particles of the other nitrate should diminish in the same proportion, or at least, should be exercised on a smaller quantity.

It would appear, therefore, from the preceding facts, to follow, that the powers which unite oxygen and nitric to an equivalent of silver and to one of copper, are in proportion to the masses necessary to effect a separation of one equivalent from each metal. But is it the simple proportion of the masses? that of their squares, or of another power? Of this we are ignorant: nothing remains but to determine the general law of the atomic proportions which are required in order to obtain the division of the current into two equal parts, when the absolute quantity of one of the elements is uncertain. This determination, which can be arrived at only by many experiments, will assist in finding the general law of the affinities of nitric, or any other acid, for all the oxides. It will then be seen whether the numbers obtained by M. E. Becquerel, in the estimate which he made by means of another process, of the affinities of certain bodies, are the same as those which I shall ultimately obtain.

I may again add, that the facts detailed in my Memoir, present a very simple process for separating two metals from their solution in the same acid. Whenever the proportion of the masses in a given volume of the solution does not admit of separation being obtained immediately, it may be effected by diluting it with water to the extent required.

ON CERTAIN FACTS RELATIVE TO THE OXIDIZED COMPOUNDS OF SULPHUR.*

BY PROFESSOR PERSOZ.

In a thesis, which I defended seven years ago before the Faculty of Sciences of Paris, I asserted that certain compound bodies, and especially sulphurous acid, are analogous to cyanogen, and, like it, may perform the function of a simple body by uniting with oxygen, sulphur, chlorine,

* Academy of Sciences, sitting of the 6th of April, 1840; from *Comptes Rendus*, No. 14.

bromine, and iodine. Setting out with this view, I had an idea of establishing a distinction in the composition of compounds, and I proposed calling the arrangement which exists among the constituent parts of a body, *molecular composition*, abstraction being made of elementary bodies contained in them. Looking at it in this way, I could no longer regard sulphuric acid as a compound formed of sulphur and oxygen, but as a compound of sulphurous acid and oxygen; in a word, I could see in this compound only the elements which contribute to its formation, and which are the same as those into which it is decomposed, namely, 2 vol. sulphurous gas and 1 vol. oxygen. Supposing this way of viewing it to be correct, sulphurous acid having become a radical, should be united with the various simple bodies with which it can combine, in order to form the compounds $\ddot{S} + O$, $\ddot{S} + S$, $\ddot{S} + Cl^2$, $\ddot{S}t + B^2$, $\ddot{S} + I^2$, in the same manner as 1 eq. of lead or manganese, unite with the same electro-negative bodies, and form the compounds $R\,O + R\,S + R\,Cl^2 + R\,B^2 + R\,I^2$.

From the examination of the combinations of sulphurous acid with oxygen, I was naturally led to study the combinations of this acid with the other metalloïds. The difficulties which this study presented were great, but did appear to me insurmountable, and I hoped very soon to obtain results worthy of the attention of chemists, when an unforeseen circumstance* obliged me, contrary to my intention, to communicate my investigations to the Academy before I had completely attained the object which I had proposed.

On causing 8 gr. of sulphur to act on 10 gr. of carbonate of potassa, and on weighing the sulphur found in the various products obtained, M. Vauquelin did not again find the whole of the 8 gr. which he employed. He obtained the following:—

Sulphur obtained in sulphuric acid	0·680
Sulphur combined with hydrogen	1·928
Sulphur obtained from the sulphuret by acetic acid	4·230
Sulphur sublimed during the operation	0·350
	7·183
Loss	·817

"What has become," asks M. Vauquelin, "of the 0·817 gr. which are deficient in this analysis? The proportions according to which I have calculated must necessarily be inaccurate, or my experiments must be wanting in precision. However, I have repeated them several times, and always with very nearly the same result."

This remark of M. Vauquelin made me suspect that some product of unknown composition had led him into error. Impressed with this idea, I repeated the preceding experiments. I fused 80 gr. of sulphur with 100 gr. of pure and dry carbonate of potassa: the matter, when cooled, was treated several times by alcohol at 40°. I thus obtained a solution colored deeply by sulphuret of potassa, and afterwards a pulverulent precipitate, which had the apparent characters of sulphate of potassa. The heated solution of this residue may be crystallized by cooling: it precipitates the barytic salts abundantly. This same residue, treated when cold by dilute acids, disengages no sulphurous acid, and does not deposit sulphur; so that, by limiting the study of these characters, it might be considered as sulphate of potassa. However, by heating it in a little tube, it abandons a certain quantity of sulphur: by treating it with ordinary nitric acid, and slightly raising the temperature, there is a decomposition of the nitric acid, accompanied by a deposit of sulphur. The latter characters sufficiently prove that this saline residue has not the composition of sulphate of potassa.

I need not detail the numerous experiments which I have made with the view of ascertaining the nature of this salt; suffice it to say, it is formed by sulpho-sulphuric acid, $\ddot{S} + S$, most of the properties of which are confounded with those of oxy-sulphuric acid, $\ddot{S} + O$. The acid contained in this salt may be liberated, and possesses greater stability than had hitherto been recognised in hypo-sulphurous acid, which has not yet been isolated.

SULPHO-SULPHURIC ACID (HYPO-SULPHUROUS ACID.)

This acid may be obtained easily and in great abundance by decomposing sulpho-sulphate of potassa or soda, with a solution of nitrate or acetate of lead. A double decomposition is effected, from which re-

* In its sitting of the 10th of March, 1840, the *Société du Muséum d'Histoire Naturelle de Strasbourg*, received a communication (for which see *The Chemist*, No. V. p. 136) from M. Langlois, in which that chemist announced that he had been enabled to isolate hypo-sulphurous acid, by decomposing bi-hypo-sulphite of potassa with hyperchloric acid. Being informed of this fact, I called upon M. Langlois next day to inform him beforehand, that having myself obtained the same acid several months ago, I intended immediately to submit my results to the Academy. I engaged him also, to do the same, with the view that our respective rights might be properly established.

salts an insoluble sulpho-sulphate of lead, which is precipitated. This salt should first be washed several times by decantation, and afterwards on a filter.

This attained, the salt is removed from the filter, and sufficient water to make a very thin paste is added: it is stirred, while a current of sulphuretted hydrogen, previously washed, is passed into it. The sulphuretted hydrogen precipitates the lead in the state of sulphuret. The liquor is filtered, and the sulphuret of lead which remains on the filter is washed. The washing waters are mixed with the first liquor; this liquor is immediately rendered turbid by a slight deposit of sulphur: which seems to me to be attributable to the slow action which the sulphuretted hydrogen exerts on the sulpho-sulphuric acid.

Sulpho-sulphuric acid, thus obtained, is diluted with water: to concentrate it, it may be evaporated either *in vacuo*, or in flat-bottomed capsules or porcelain saucers placed on a stove. So long as it does not boil, it is but feebly decomposed, and that occurs only as it approaches its highest point of concentration. At that period heat destroys it, and it is decomposed into its elements, namely, sulphurous acid and sulphur.

I do not exactly know the density of this acid, but I have reason to believe that it is nearly twice that of water.

Sulpho-sulphuric acid is a white liquid; it reddens tincture of turnsole strongly. It decomposes, without heat, the carbonates of potasse, soda, lime, magnesia, and lead: it combines directly with bases, and forms salts (sulpho-sulphates,) which are to the oxy-sulphates what the seleniates are to the sulphates, or, indeed, what the arseniates are to the phosphates. An analogy may be observed, whether we look at the relative solubility of these salts, or at the respective proportions of bases and acids, or those of the salts and water of crystallization. It may be remarked in general, that the sulpho-sulphates are rather more soluble than the corresponding oxy-sulphates.

Sulpho-sulphuric acid, put in contact with easily reduced oxides, can be combined with them only at a moderate temperature; for in the contrary case, there is a destruction of the acid and of the base, and formation of sulphuret (oxide of *silver*).

In contact with the simple bodies or compounds which have a direct action either on sulphur, or on sulphurous gas, and one of the elements of sulpho-sulphuric acid, the latter is always decomposed. Thus, for example, even when it is not very concentrated, it cannot exist even when cold, nor in presence of sulphuric acid; for that acid operates its decomposition when cold, by seizing the sulphurous acid and freeing the sulphur: nor in presence of nitric acid, for there is a mutual decomposition of the sulpho-sulphuric and nitric acids, which is rendered evident by an abundant deposit of sulphur, accompanied with nitrous vapour, which remain dissolved in the excess of nitric acid, and color it green: nor in presence of chlorous (hypo-chlorous acid) or chloric acids, which oxidize the sulphurous acid, and set the sulphur free.

Saline compounds, which are formed, either by acids, or bases of easy reduction, cannot exist in contact with sulpho-sulphuric acid without being decomposed: but sometimes the reaction is performed at the ordinary temperature, and sometimes, on the contrary, it occurs only at an elevated temperature.

By the works of M. Peltier, Sen., we are made acquainted with the mutual alteration which takes place between sulphurous acid and the chlorides of tin. This property is also retained in sulpho-sulphuric acid. The latter, heated with chloride of tin, is decomposed with production of sulphuret of tin. Salts of iron and uranium are reduced to the state of subsalts.

On account of its analogy with oxy-sulphuric acid, sulpho-sulphuric acid exerts a displacing action on the salts, and gives rise to sparingly soluble precipitates in all the saline solutions in which sulphuric acid itself produces a precipitate. It is thus that it precipitates salts of baryta, strontia, and lead, white; those of silver, yellow, turning to brown; the mercurial salts, white or canary yellow. It is also by reason of this analogy that sulpho-sulphuric acid does not render turbid those salts of which the corresponding sulphate is soluble.

The manner in which sulpho-sulphuric acid acts, and its analogy with sulphuric acid, readily give us an idea of the properties of the sulpho-sulphates. These are deduced, when the phenomena of displacing, or indeed, combinations, occur, from all the characters ascertained in the sulphates, and when the phenomena of alteration occur, from the properties we have just noticed as appertaining to sulpho-sulphuric acid.

FACTS RELATIVE TO SULPHO-SULPHURIC ACID AND ITS COMBINATIONS.

BY PROFESSOR PERSOZ.

The author sums up the results of his recent investigation in the following terms:

1st. The various salts designated by the name of *hyposulphite*, must not be compounded with one another.

2d. In the formation of bi-hyposulphites, there are formed several salts, which vary in

their properties and composition, and which may sometimes have an oxide for a base, sometimes a sulphuret, and sometimes even a mixture of an oxi-base with a sulpho-base.

3d. Sulpho-sulphuric acid may be obtained in large quantities, by acting on sulphurous acid with sulphuretted hydrogen, under the influence of water.

4th. This acid may likewise be obtained by causing sulphuretted hydrogen to act on sulphuric acid.

ON THE PRESENCE OF IODINE IN COD-OIL.*

BY L. GMELIN.

I formerly announced that I had been unable to detect iodine in two sorts of cod-oil, one of which was of a light color, and the other brown, and I left the question undecided, whether the iodine found by other chemists arose from iodide of soda used in the experiments, or whether certain species of this oil actually contained iodine. The following investigations show that cod-oil evidently contains iodine, and that the kinds which I had first examined were sophisticated.

By treating 60 grammes of pure cod-oil, procured from Bergen in Norway, by Hansmann's method, I obtained, by solution in alcohol, a saline mass, which acted in the following manner: — Its aqeous solution, mixed with starch and dilute sulphuric acid, gave a violet color, which disappeared immediately by the addition of oil of vitriol, and gave place to a yellow color: this solution gave also, with starch and hydrochloric acid, a violet colour, which disappeared on the addition of chlorate of potassa. The experiment was repeated with 750 grammes of the same oil. The phenomena were the same; only, on account of the greater quantity, the coloring of the starch was much more intense, and was not so readily destroyed by oil of vitriol or chlorate of potassa. Carburet of sulphur, stirred with the aqueous solution of the saline mass, to which hydro-chloric or dilute sulphuric acid had been added, was turned of a violet color: part of the dried saline mass was thrown into a mixture of peroxide of manganese and moderately diluted sulphuric acid, which had previously been heated in a glass tube, and violet vapours of iodine were immediately observed to rise, which turned starched paper blue.

These experiments put the presence of iodine in this oil beyond doubt: but it is surprising that the saline mass should give up iodine by the simple addition of hydrochloric or dilute sulphuric acid, which has never been observed with iodide of potassium, as demonstrated in the most positive manner by many counterproofs, in which the blue coloring of starch is produced only by the addition of an oxygenising body, such as oil of vitriol, or chlorate of potassa. It is therefore probable, that the saline mass heated to redness does not contain iodide of potassium, but basic hypo-iodite of potassa. MM. Magnus and Ammermüller and M. Liebig have already directed attention to the hypo-iodite of soda formed by the calcination of basic hypo-iodate of soda, or of a mixture of iodide of sodium and iodate of soda. If a soap of soda be dissolved in water, evaporated and calcined, alcohol removes from it a saline mass, which produces a blue coloration with starch and hydrochloric acid. Although MM. Ammermüller and Magnus observed that in the calcination of basic hyper-iodate of potassa, iodide of potassium alone is obtained, it is not impossible, however, that in the calcination of the soap of cod-oil, where traces of iodide of potassium are disseminated in a great mass of carbonated and caustic potassa, the alkali, acting in excess, disposes the iodide of potassium to absorb oxygen from the air during and after the combustion of part of the carbon, and to form a similar salt in combination with a greater quantity of potassa.

According to my investigations, the following method appears to be the most convenient for detecting iodine in cod-oil, with the least loss of iodine: in a sand bath, 15 grammes of cod-oil are saponified with as much, or rather less, hydrate of potassa, and the necessary quantity of water: when cold, it is filtered in order to separate the aqueous liquid from the very soft soap; it is neutralized almost completely with sulphuric acid; the remaining liquor is evaporated: the residue is calcined: it is boiled in powder with alcohol, and the filtered liquor is evaporated. The saline mass thus obtained, dissolved in a little water is sufficient for three reactions and even more, for example: with starch and oil of vitriol; with starch, hydrochloric acid and chlorate of potassa; with carburet of sulphur and oil of vitriol: hydrochloric acid alone and dilute sulphuric acid do not cause starch to be colored blue with this saline mass, because it contains iodine under the form of iodide of potassium.†

* *Journal de Pharmacie*, April, 1840.

† These experiments have been successfully repeated on cod-oil procured in Paris. By saponifying with hydrate of potassa on the open fire, which renders the operation more rapid, the violet coloration of the starch was effected, even with dilute sulphuric acid.

The iodine contained in cod-oil being, at

In conclusion I may observe, that, according to the evidence of M. J. Tiedemann, a merchant at Bremen, who possesses great knowledge concerning this article, there are in commerce three sorts of cod-oil. Indeed, the oil is procured by exposing the liver of the cod (*Gadus Callarias*, Linn.) to the sun, in casks placed upright, and furnished with three bungholes one above another. When the uppermost bung is removed, we have the clearest oil, which is the fittest for medical use. The middle and lower bungs are afterwards withdrawn, and a brown oil is obtained. The residue, expressed with heat, yields a very dark brown and thick oil, which is used by leather-dressers.

ON THE IODIDES OF MERCURY.*

BY M. SOUVILLE.

The author commences the chemical study of the iodides of mercury, after giving the reasons which led him to choose this subject, and which were deduced from the importance that the compounds with which he is engaged have acquired in therapeutics owing to the works of MM. Biett, Ricord, and Gibert, and the more recent ones of Dr. Puche.

Setting aside all that has already been said on this subject, we here relate only the new and very interesting observations which are to be met with in this Memoir. In M. Souville's opinion the action of nitric and sulphuric acids on prot-iodide of mercury has not been studied with sufficient care: when cold, these acids, concentrated or diluted, are without action on the iodide; but when warm, the latter is decomposed, half of the mercury which it contains is oxidized by part of the nitric or sulphuric acid, which is itself decomposed; there results on one hand deut-iodide, and on the other, deut-oxide of mercury which combines with the undecomposed acid and forms nitrate or sulphate of the binoxide, which combines with the deut-iodide, whence result peculiar salts. Somewhat similar phenomena are produced by the action of nitric and sulphuric acids on deut-iodide of mercury: when cold, these acids, however concentrated they may be, are incapable of altering it, but with heat the action is very vivid; there occurs with nitric acid a disengagement of reddish vapours mixed with vapours of iodine, half the deut-iodide is decomposed, the iodine is volatilized while the mercury is oxidised by the nitric acid, and forms a nitrate which afterwards combines with the undecomposed deut-iodide forming the same salt as was obtained by the action of nitric acid on the prot-iodide of mercury; with sulphuric acid, there is also a decomposition of half the deut-iodide, disengagement of sulphurous acid and vapours of iodine, and production of sulphate of binoxide of mercury, which combines with the undecomposed deut-iodide, and forms with it a crystallizable salt.

The author observes that the crystallization of deut-iodide of mercury is very variable: thus, bracteæ of various forms may be obtained by crystallizing this salt in a solution of acid nitrate of mercury or iodide of potassium; sometimes by availing ourselves of the latter vehicle, we obtain prismatic crystals which are formed of a series of octohedra inserted into one another.

The deut-iodide of mercury, in combining with the alkaline iodides and some chlorides, acts the part of an acid with relation to these compounds. It combines, also, with hydrochloric and hydriodic acids, and the nitrates and sulphates of binoxide of mercury. M. Souville admits that, in this case, it acts the part of a base; consequently he divides the consideration of the saline combinations of deut-iodide of mercury into two sections: the first comprising the salts which have iodide of mercury for their electro-negative element, and the second, those in which it acts as a base, or electro-positive element. We commence with the second.

DOUBLE NITRATE OF BINOXIDE AND BINIODIDE OF MERCURY.

This is a new salt, discovered by M. Souville: it is produced by the action of nitric acid on prot-iodide or deut-iodide of mercury. This salt is in white, pearly crystals, which are formed only in concentrated nitric acid. Water decomposes it, and separates from it deut-iodide of mercury which is precipitated with a certain quantity of subnitrate; the liquid contains acid nitrate of mercury and a small quantity of deut-iodide. This salt is anhydrous and decomposable by heat: the deut-iodide separates from the nitrate which is decomposed. Analysis has given as its composition, one atom of nitrate of binoxide of mercury and one atom of deut-iodide. It is prepared by boiling an excess of concentrated nitric acid with prot-iodide of mercury: it is filtered and left to cool; crystals are then deposited.

DOUBLE SULPHATE OF BINOXIDE AND BINIODIDE OF MERCURY.

This salt is completely analogous to the preceding, and, like it, decomposable by water and heat: it crystallizes only in con-

least as we have every reason to believe, the essential cause of its medicinal properties, apothecaries should not use this oil until they have tested it.

* *Journal des Connaissances Medicales*, April, 1840.

centrated sulphuric acid. It was found to be formed of one atom of sulphate of binoxide of mercury, and one atom of biniodide of mercury: it is prepared by heating concentrated sulphuric acid with prot-iodide of mercury; it is decanted and left to cool; crystals are immediately formed; they are separated by decantation, and afterwards washed with alcohol at 40°.

M. Souville considers these compounds as sub-salts, in which an atom of binoxide of mercury is replaced by an atom of deut-iodide of the same metal; he remarks that this kind of compound, although very rare in chemistry has, however, sometimes been observed: thus M. Wöhler has made known a crystalline combination of nitrate of silver and cyanide of mercury.

The compounds in which deut-iodide of mercury acts as an acid were discovered by MM. P. Boullay and De Bonsdorf. They are called iodhydrargyrates.

M. De Bonsdorf, having observed that deut-iodide of mercury was dissolved in a solution of iodide of potassium in proportions varying with the quantity of water employed, and the elevation or depression of the temperature, concluded that there did not exist definite combinations between the iodides of mercury and potassium. M. Boullay, on his part, admitted that they formed true salts in definite proportions; namely, the prot-iodhydrargyrate, containing one atom of each element; the deut-iodhydrargyrate, containing two atoms of red iodide and an alkaline iodide; and the trit-iodhydrargyrate, containing two atoms of the first and one of the second.

M. Souville shows that of these three salts there exists but one, crystallized deut-iodhydrargyrate, which is decomposed by water, but is readily dissolved in a solution of iodide of potassium.

In heating a solution of cyanide of potassium with deut-iodide of mercury, M. Souville observed, that there was a double decomposition, and that bicyanide of mercury and iodide of potassium were formed, which combined together and caused the formation of beautiful white pearly needles. This combination had already been formed by M. Caillot; but it had not been analysed: M. Souville ascertained that it was formed of two atoms of bicyanide of mercury, and one atom of iodide of potassium without water: he has given it the name of bi-cyanhydrargyrate of iodide of potassium.

Deut-iodide of mercury, by the intermedium of water and heat, decomposes the yellow cyanide of potassium and iron, first precipitating from it the protocyanide of iron, and afterwards reacting on the cyanide of potassium, as if the latter were entirely insulated: bi-cyanhydrargyrate is then formed. Finally, M. Souville, after having pointed out, in a succint manner, the benefits which medicine has derived from these compounds, mentions some new formulæ of Dr. Puche, who has used, with much success, iodhydrargyrate of iodide of potassium: it may be useful to give these formulæ here.

POMMADE OF IODHYDRARGYRATE OF POTASSIUM.

Hog's lard . .	30·00 grammes.
Deut-iodide of mercury	0·50 centigrammes.
Iodide of potassium .	0·50 centigrammes.

SOLUTION OF IODHYDRARGYRATE CORRESPONDING TO VAN SWIETEN'S LIQUOR.

Distilled water . .	25·000 grammes.
Deut-iodide of mercury	0·025 milligrammes.
Iodide of potassium	0·025 milligrammes.

In pills, the iodhydrargyrate is administered in doses of from two to ten centigrammes.

This medicine has the advantage of being very active, and of not producing salivation so promptly as other mercurial preparations.

ON THE IODIDE OF CINNAMYLE.*

BY M. DESPAN.

My attention having been frequently attracted by the turbid appearance of a draught, containing distilled cinnamon water, iodide of potassium and iodine, I made some investigations to ascertain the cause of this phenomenon, and I was fortunate enough to obtain the body which I now present to the *Société de Pharmacie*.

The proportions which have appeared to me best adapted to its formation are:—

Iodide of potassium . .	2·50
Iodine	0·10
Distilled cinnamon water .	100·00

Iodide of potassium and iodine are first dissolved in distilled water; this solution is afterwards mixed with cinnamon water: the mixture immediately becomes of a yellowish red color: there are soon perceived on its surface a multitude of small shining needles, of a golden yellow color and metallic lustre: at the end of twelve hours, these crystals are deposited at the bottom of the vessel and may be collected on a filter and dried in a moderately heated stove.

When dried, these crystals preserve the same appearance, namely, the form of very fine needles, the golden yellow color and the metallic lustre. Their taste is sweet, and they have the smell of cinnamon.

A small quantity of this compound, rubbed with the nail on paper, forms on it a

* *Journal de Pharmacie*, April, 1840.

thin layer exhibiting the metallic lustre of a sheet of gold.

A few crystals exposed to the air on a sheet of paper in a place, the temperature of which was about 10 C., were entirely volatilised at the expiration of twenty-four hours, without leaving any trace on the paper.

These crystals melt at a moderate temperature, and the heat of the hand alone is sufficient to produce this phenomenon: by cooling, the liquid is again crystallised.

Heated more powerfully and with the contact of air, they melt, and are then gradually dissipated, at first giving out the smell of essence of cinnamon, afterwards, towards the end, a perceptible smell of iodine, and at the same time violet vapours appear.

A certain quantity of these crystals heated on a sheet of platinum, burned vividly, with a yellowish white flame, and left a little carbonaceous layer, which disappeared without leaving any residue.

Introduced into a small retort which was placed on a sand-bath slowly and gradually heated, they entered into fusion, and the interior of the retort was filled with reddish brown vapours, which condensed in the upper part in small blackish red drops. When the temperature increases, violet vapours appear, an oleaginous liquid of a very deep red color condenses in the neck of the retort, and flows into the receiver: this liquor always has the smell of cinnamon and a sweet taste; it burns like the essential oils, and does not seem to be crystallizable. There remains at the bottom a small quantity of carbon.

Treated by distilled water, these crystals appeared to me to be dissolved only after having undergone decomposition: at any rate, if a small quantity of it be triturated in a mortar, and if water be poured in by small portions, they are liquefied, acquire a deep red color, and give rise to small drops of an oily appearance exhaling the smell of iodine.

This compound is soluble in alcohol, and especially in ether. The latter solution, abandoned to spontaneous evaporation, leaves an abundant crystalline layer at the bottom of the vessel.

Such are the properties which I have observed in this substance: my occupations not permitting me, for a time, to study them more profoundly, I thought, nevertheless, that these first results might be of some interest, and I determined, therefore, to present them, until circumstances permit me to make a more extended examination of them.

The nature of the substances which cause the formation of this body, and the circumstances under which it is formed, cause it to be regarded as analogous to iodide of benzoyle, and as constituting an iodide of cinnamyle: but elementary analysis alone can set this question at rest.

ON THE ESSENCES OF TARRAGON AND SAVINE; ON CINNHYDRAMIDE, AND ON BROMIDE OF CAMPHOR.*

BY M. LANNENT.

Essence of tarragon boils at 206°. Its density = 0·945.

The density of the vapour = 6·157.

Its formula is $C^{40}\ H^{32}\ O^2$: it represents 4 volumes of vapour.

It may be combined with sulphuric acid, forming an acid which I call sulpho-draconic.

The formula of sulpho-draconate of baryta is $C^{40}\ H^{30}\ O^2,\ SO^3 + Ba\ O$.

This essence yields, with nitric acid, five new crystallizable acids.

The essence of savine has the same composition and properties as essence of turpentine.

Cinnhydramide is a crystallized substance which I obtained with ammonia and essence of cinnamon: its formula is $C^{36}\ H^{16}\ Az^{\frac{1}{3}}O$.

The law of substitutions is here at fault; for the essence of cinnamon has lost one equivalent of oxygen, and has gained three equivalents of hydrogen and azote.

It may take place by means of the following reaction:—

$(C^{36}H^{14}O^2 + H^3) + H^4Az^{\frac{1}{3}} = (C^{36}H^{14}Az^{\frac{1}{3}} + H^2 + H^3\ O) + H^2\ O$, which is disengaged.

Bromide of camphor is a crystallized body, which is formed by mixing bromine and camphor. Its formula is $C^{40}\ H^{32}\ O^2 + Br^4$.

Its properties are such, that we can look upon it only as a bromide, for, on exposure to the air, it liquifies almost immediately; bromine is disengaged, and the camphor remains.

Ammonia converts it immediately into camphor.

Distillation likewise transforms bromide of camphor into bromine and camphor; but, at the same time, a little hydro-bromic acid is disengaged, and a small quantity of an oily matter, containing bromine, is formed. The latter should be the result of the following reaction:—

$C^{40}\ H^{30}\ O^2 + Br^4 = C^{40}\ H^{30}\ Br^2\ O^2 + H^2\ Br^2$, which is disengaged.

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† *Comptes Rendus*, No. 13, March 30, 1840.

ON THE REDUCTION OF PLATINUM FROM THE CHLORIDE OF PLATINIUM AND POTASSA.

BY VICTOR PARISOT.

It is well known that chloride of platinum is employed in laboratories, for detecting the presence of potassa, or its salts, in various liquids. Being consulted as to the readiest means of extracting the platinum contained in these residues arising from these experiments, I performed some experiments, the results of which are here communicated.

The process which I employed and which succeeded, is based on the property which zinc possesses of precipitating metals when it is put into contact with their acid solutions.

This process consists in taking the precipitate of chloride of platinum, or the liquid which holds it in solution; in diluting it with water in order that solution may be complete; and in saturating this liquid with sulphuric acid, added in excess. If the liquid, as sometimes occurs, contain any carbonates, the acid must be added with caution, in order not to lose a portion of the product, which might take place, if effervescence were too rapid.

The liquid being acid, a bar of zinc is plunged into it: it is then observed that there is a decomposition of the water, disengagement of hydrogen and formation of sulphate of zinc which remains in solution, while the platinum is precipitated under the form of a black powder.

The reaction and the disengagement of hydrogen may be maintained by adding a little acid, and that until the platinum is precipitated; which is easily ascertained by the liquor being completely decolored.

When the platinum is reduced it is collected on a filter: it is washed in boiling water, and allowed to dry, and, in order to deprive it of any small quantity of metal which it might retain, it is treated by hydrochloric acid and heat, washed in boiling water; and afterwards treated by hydrochloro-nitric acid in order to obtain chloride of platinum, which may be used in other experiments.

ANALYSIS OF THE LEAVES OF THE DIGITALIS AMBIGUA.*

BY M. SCHLÆSINGER.

According to this chemist, 100 parts of these leaves dried are composed of:—

Chlorophylle, in two different modifications	12·67
Resin	11·39
Extractive matter and sulphate of lime	8·56
Coloring matter	22·86
Gum, with chloride of sodium and sulphate of lime	14·90
Phosphate of magnesia	2·91
Albumen	12·67
Fibre	14·04
	100·00

The recent leaves contain 81·5 of water.

122 gr. gave 17 decigr. of ashes, composed, in grains, of

Phosphate of magnesia	3·493
Sulphate of lime	10·259
Carbonate of lime	6·273
Chloride of sodium	7·561
Silica	4·250
	31·836

* *Pharm. centrablatt.*

CHEMICAL EXAMINATION OF THE LIQUOR AMNII OF A WOMAN IN THE FIFTH MONTH OF PREGNANCY.†

BY J. L. LASSAIGNE.

Last summer, Dr. Donné sent me, for examination, the liquor amnii extracted from the amnion of a young woman who died in the fifth month of her pregnancy.

It was colorless and inodorous, had a slight alkaline reaction on test papers, and was rendered rather milky and turbid by white, viscous, insoluble flakes, formed of mucus and fatty matter. Its density, taken at the temperature of + 17 centig., was about 1·009.

Evaporated to dryness in a porcelain capsule, it left a saline residue whose weight formed $\frac{115}{10000}$ of the whole mass of liquid.

The different experiments to which this liquor was submitted, lead me to consider it as formed, in the hundred parts, of—

Water	98·85
Organic matter	00·60
Albumen, uncrystallizable extractive matter, analogous to osmazome.	
Inorganic matter	00·55
Chloride of sodium, chloride of potassium, carbonate of soda, traces of phosphate and sulphate of soda, traces of phosphate of lime.	
	100·00

The fatty matter whose presence in the insoluble viscous flakes was remarked, was but partially saponified by a solution of caustic potassa. The small quantity of it

† *Journal de Chimie Médicale*, April 1840.

which I had extracted, did not allow me to study it in such a manner as to establish its distinctive characters.

ANALYSIS OF TWO ARTHRITIC CONCRETIONS.*

BY MM. PAUQUY AND BOR.

These concretions were formed:—

1st. Of urate of soda;

2nd. Of urate of lime;

3rd. Of an albuminous animal matter.

They contained neither phosphate nor chloride of sodium; they were almost completely soluble, except one part, of a membranous appearance, which remained undissolved; and the authors conclude that an alkaline liquid administered internally might, in certain cases, prevent the formation of these concretions, or at least relieve those afflicted with them.

MODE OF ESSAYING QUINQUINA.†

The different proportions of alkaloids contained in quinquina induce us to publish the following mode of essaying it, which was communicated to us by M.M. Thibon-Méry, who has practised it repeatedly.

One kilogramme of quinquina is reduced to powder, and treated by ten quarts of alcohol acidulated with 16 grammes of sulphuric acid at 66°: it is distilled to half, namely, to five quarts, decanted, strained with pressure, and subjected to a fresh treatment with the same quantities of alcohol and acid; the liquors are mixed, and 64 grammes of quicklime, in powder, and 64 grammes of fine animal charcoal, of good quality, are added; the whole is distilled until there remains only five quarts of liquid in the cucurbit; it is filtered and distilled *de novo* in a sandbath, in order to separate the alcohol from the quinine, which remains in the retort.‡ This quinine, dissolved with a slight excess of dilute sulphuric acid, treated by 16 grammes of animal charcoal, yields a liquor which, filtered, gives white sulphate of quinine, whose quantity represents the commercial value of the quinquina.

The essaying of some quinquinas is so much the more necessary, as, according to the view given by M. C. H. Pfaff, in his memoir printed in the monography of Berghem concerning the quantities, these barks furnish the following proportions in 1000 grammes:—

	Cinchonine.	Sulphate of Quinine.
Huanuco, called Lima . .	36·46	,, ,,
Pitaya (Guibourt) . . .	23·11	11·52
Red	31·94	1.56
Royal yellow, called Calysaya	,, ,.	28·00
Huamaties, called Havannah	16·50	,, ,,
Yellow Carthagena . . .	5 90	5·21
Loxa	,, ,,	9·25

It is evident, according to these results, that the Huanuco, called *Lima*, contained 36.46 vegetable alkaloid; the Pitaya, 34·52:§ and the red, 33·50; the yellow royal, or Calysaya, 28·00; the Huamaties, or Havannah, 16·50; the yellow Carthagena, 11·11; the Loxa, 9·25.

* *Journal des Connaissances Médicales.*

† *Journal de Chimie Médicale*, April, 1840.

‡ The apparatus should be varied according to the quantities of quinquina to be treated.

§ This is incorrect; it should be 34·63.—SUB.-ED.

II. CHEMICAL MANUFACTURES.

NEW WRITING FLUID.

To the Editor of the Chemist.

Wraxall, near Bristol, April 28, 1840.

MY DEAR SIR,—A good durable writing fluid, which will remain unaffected by moisture, acids, alkalies, and even by chlorine, to the extent to which paper or parchment can resist these destructive agents, and also capable of flowing as freely from the pen over the most unctuous surfaces, as over a surface absolutely free from grease, cannot but be a desideratum to those whose pursuits engage them much in the laboratory, and whose memoranda (frequently made in the midst of acrid vapours) are often required to be of a permanent nature.

A fluid embracing all the desiderata here mentioned I have prepared in the following manner, and I have much pleasure in making it known to my scientific brethren.

℞ Shell Lac ..... 2 ounces.
Borax ..... 1 ounce.
Distilled, or rain water..18 ounces.

Boil the whole in a closely covered tin vessel, stirring it occasionally with a glass rod, or a small stick, until the mixture has become homogeneous. Filter, when cold, through a single sheet of blotting-paper.

Mix the filtered solution (which will be about 19 fluid ounces) with one ounce of mucilage of gum acacia (prepared by dissolving one ounce of gum in two ounces of water), and add pulverised indigo and lamp black *ad libitum*. Boil the whole again in the covered vessel, and stir the fluid well to effect the complete solution and admixture of the mucilage of gum acacia. Stir it occasionally while it is cooling; and after it has remained undisturbed for about two or three hours, that the excess of indigo and lamp black may subside, bottle it for use.

As much of the coloring matter will even then be held in suspension, it will be prudent to agitate the bottle that contains this ink, previous to its employment.

There is scarcely a chemical reagent which will not instantly decompose this ink while in a fluid state: hence it should always be used with a clean pen; but when it has once become dry (and it dries with as much facility as any of the ordinary inks) it will resist the long continued action of water, spirit of turpentine, alcohol, diluted sulphuric acid, diluted hydrochloric acid, oxalic acid, chlorine, and solution of caustic potassa. These, being sufficiently severe tests, are the only menstrua which I have considered it necessary to employ. I enclose a few specimens of the action of these "destructives" upon the fluid described, contrasting its power of resisting their influence with that of six varieties of very generally adopted inks prepared by celebrated manufacturers. The lines upon each specimen are numbered 1, 2, 3, 4, 5, 6, and 7, and on the reverse side of each specimen is written the name of the menstruum employed.

No. 1 is my Laboratory Ink.
No. 2 is Perry's Ink.
No. 3 is Stephens's Blue Writing Fluid.
No. 4 is Webster's Manganese Ink.
No. 5 is Hathway's Superior Ink.
No. 6 is Walkden's Extra Ink, prepared by Messrs. Terry & Co.
No. 7 is Walkden's Japan Ink, prepared by ditto.

I have forwarded to the Secretary of the "Society for the Encouragement of Arts, &c.," a copy of the formula for the preparation of this writing fluid, and likewise a series of specimens similar to that which I have enclosed for you.

This fluid is admirably adapted for writing upon parchment, and it ought to supersede every other ink for all important documents. This communication is written with the fluid in question. Your readers will probably feel obliged by your opinion as to its merits.

I have lately been informed that the Hindoos prepare an ink somewhat similar in composition to the writing fluid which I have described; but I cannot obtain any specific formula for its preparation to enable me to compare the respective qualifications of each.

The expense of preparing the fluid herein described will be about one shilling for forty fluid ounces.

I remain, dear Sir,
Yours very truly,
CHAS. THORNTON COATHUPE.

P.S. Of course I do not invite your attention to the color of this ink, as you know that it may be either very black, blue, or otherwise, depending entirely upon the quantity of the coloring ingredients which any person who may make it for himself may think fit to include in the bottles which he sets aside for his own use. It will not be more permanent for being darker, nor will it flow so freely from the pen, if allowed to be very black.

C. T. C.

[We made many trials of the writing fluid composed according to Mr. Coathupe's formula, and are fully satisfied of its complete adaptation to the various purposes for which it is recommended. It perfectly withstands all the tests enumerated in the description, and we feel confident that it will be found a valuable substitute for the various kinds of ink made with sulphate of iron and other metallic preparations. We can also testify to its superiority in all the other respects mentioned by Mr. Coathupe at the commencement of his letter.—ED.]

ON THE ADULTERATION OF PORTER.

BY CHARLES WATT.

Of all the adulterations practised by retailers in the commodities of life, none are so frequent or injurious to health as those of excisable articles, and more especially of porter, the common beverage of the people.

That this is a serious evil to public health, to the brewer and to the revenue, must be apparent to every one who considers that porter is consumed in vast quantities by the lower classes, and that it forms an article of extensive commerce.

Such is the extent to which adulterations and frauds in this article are carried by the retail dealers, that to get porter genuine as sent out by the brewers, is almost impossible. Such too is the difficulty of detecting the fraud, and punishing those committing it, that the case is abandoned as hopeless, and the imposition submitted to by the public and the excise, as one beyond their power to remedy.

Every effort has indeed been made, both by the excise and the brewer, to detect the guilty; gross cases have been publicly exposed, and suitable examples have been made, by the infliction of fines. Compared, however, with the extent of the evil, those examples are so few as to afford little or no protection to the public; having taken place only where long continuance in adulteration had made the parties so careless as to become suspected, to be informed against, and to be subsequently discovered by the officers even in the fraudulent act.

The danger of such detection, however, is easily avoided by their, from time to time, performing the operation in the cellar upon the beer, when required to be drawn; and it is well known that, thus secure, this fraud is carried on with such recklessness and impunity, that the publicans, and especially the proprietors of those dens of drunkards called gin-palaces, make at least three butts of porter out of two.

For this purpose, they mix up with it compounds of treacle and water, Spanish liquorice, sugar and water, sulphate of iron, salt, and infusions of various substances, such as gentian root, &c. But these are harmless, and even beneficial, compared with the decoction of cocculus indicus, strychnia, and even tobacco-water,—employed to deceive the taste and counterfeit the properties of the genuine beer.

The excise and brewers have employed chemists, with a view to obtain certain tests by which to discover these impositions; but with no certain success. In fact, such discovery is impossible; as the substances with which beer is mostly adulterated, cannot be subjected to this kind of analysis. Still, however, the imposition is too injurious to be suffered to go on without a check; more especially as the method I am about to describe may, with the joint co-operation of the excise and the brewers, put a stop to it.

In the numerous experiments I have made with porter from public houses, with the exception of the filth put in to deceive the palate, &c., the principal point demanding attention is the quantity of water employed to increase the profit of the publican. This I have found to be quite equal to one-third of the beer as it is delivered by the brewer.

This point established, (and I shall soon show that it is so beyond all question,) the fraud on the brewer, the revenue, and the public, is at once made evident; in so far as it is beer containing a given quantity of vinous spirit which is furnished by the brewer,—whose proportion of ingredients and water are always the same, yielding an article of uniform strength, and paying a corresponding duty to the revenue,—and which the public has a right to expect from the hands of the retailer. It is therefore quite clear that any reduction of spirit by dilution is a fraud upon all these parties.

I may now describe the means I adopted to detect the precise amount of adulteration, in this respect, of the beer kept by publicans, as compared with that made and sent out by the brewers.

I took a pint of genuine porter from each of different brewers, and put it into a small still heated by a spirit lamp; and, after distilling over all the spirit, and then subjecting it to a second rectification, I found it to contain about two ounces, or two ounces and a half, of spirit somewhere about proof; but I was not exact in this, as it is not of much moment, and for practical purposes can be more minutely conducted. In the porter taken from different breweries I found not much deviation in this respect, and I therefore assume the quantity of spirit I have named as about the average quantity in good and genuine porter.

My next step was, of course, to subject a pint of porter procured from various public houses to the same process of distillation, and after careful rectification, to note the quantity of spirit; and here I found a diminution of spirit of from half a fluid ounce to an ounce, and sometimes even more.* These experiments, which were often repeated, satisfied my mind, as they must those of all who consider the subject, that with the publican alone lies the disgrace of this fraudulent practice.

The other nauseous materials put in to give *flavour* and deceive the taste, may, after the distillation, be subjected more easily to analysis, if judged proper; but I would here observe, that it is a somewhat nice and difficult operation, as they are generally inert, and what may be called merely nauseous substances, though they are too often injurious and even poisonous.

From the preceding facts, it will at once be evident, that a remedy against this fraud is at hand, both for the revenue and the public; and I would suggest the following method of proceeding to detect and punish those who violate the laws in this respect.

Let the officers go to the publicans in their district, and procure a given quantity, not less than a pint, of porter, at such house or houses as they may suspect or be informed of; then let some competent per-

* It is a singular fact, that few think of judging of porter by its strength or body, whereas they immediately detect and complain of any defect in this respect in ale; and therefore it cannot be so easily diluted.

son perform the distillation according to the method and with the care I have advised; and subsequently let him repeat the operation upon the same quantity of genuine porter procured from the brewer who supplies the publican from whom the suspected sample was obtained; and finally, by noting the different quantities of alcohol yielded by each sample, he will arrive at the fact of adulteration; for if the one affords less alcohol than the other, it must have been diluted with water.

The next step after the distillation is to evaporate the remaining spent beer from each sample—the publican's and the genuine, which will better enable the operator to ascertain the fact of the former containing any, and what kind of, extraneous and injurious ingredients, by comparison and other means; for although such ingredients as treacle and water, or sugar and water, cannot be detected, some of the more deleterious ones, if the experiment be carefully conducted, may be rendered evident by such tests as the case may indicate. If this plan be strictly carried out, an entire stop will at once be put to this long-continued fraud.

We here, by no means, intend to offer any opinion upon the effects of porter or other fermented liquors upon the human constitution; we know the mischief produced by alcohol in every shape; but so long as these liquors continue to be the common beverages of the country, it is of importance that they should be supplied to the public in a genuine form, free from nauseous and poisonous admixtures, and that, at the same time, the revenue and the brewer should be protected in their duties and profits. Wherever, therefore, it is in our power to aid in the detection or suppression of this or any other frauds injurious to the health of the community, no considerations shall induce us to relinquish our purpose.

CHEMICAL INVESTIGATIONS CONCERNING DYEING.—ON THE IMMEDIATE COMPOSITION OF WOOL.—ON THE THEORY OF SCOURING IT; AND ON CERTAIN PROPERTIES DERIVED FROM ITS IMMEDIATE COMPOSITION, WHICH EXERT AN INFLUENCE IN DYEING IT.*

BY M. CHEVREUL.

Wool has hitherto been but little studied with respect to those of its properties which influence the success of the operations it undergoes in dyeing. On account of this deficiency, it has been impossible to foresee the inconveniencies to which the presence of certain bodies, accidentally mixed with it, or added by design, might give rise. For the same reason also, it has not been possible to give an exact account, still less to recognise the cause of the inequalities manifested in the color of wool, whether spun or woven, which the dyer wishes to dye in an uniform manner. I therefore considered it my duty to pay very particular attention to a detailed examination of wool: for its immediate composition certainly is more complex than that of any other stuff: consequently, it is necessary to determine the influence which its immediate principles exert in a given case, and which, according to a paper I read to the Academy of Sciences in 1828, are, at least, three in number, in wool cleansed by distilled water, namely:—

1st. A fatty substance, solid at the ordinary temperature, and perfectly liquid at 60° C.

2d. A fatty substance, liquid at 15° C.

3d. A filamentous substance, constituting wool, properly so called.

I have said that wool contains at least three immediate principles, because, according to my observations, the filamentous substance disengages sulphur, or hydrosulphuric acid, without losing its characteristic and essential properties; whence it appeared to me probable that the sulphur entered as an element into the composition of a body perfectly distinct from the filamentous substance, properly so called. To demonstrate the correctness of this opinion, and the conclusions to be deduced from it, as regards both chemical manufactures and physiology, is one of the principal objects of this Memoir. But before doing so, it may be as well to explain some of the chemical properties of wool in the state in which it is employed.

1. ON CERTAIN PROPERTIES OF CLEANSED WOOL.

1000 parts of wool, well cleansed from foreign matters, and subjected to the mechanical processes of division and ventilation, yield from 5 to 3 of ashes, generally formed of the phosphates of lime and magnesia, of sulphate of lime, of lime, of peroxide of iron, of silica, and sometimes of peroxide of manganese.

Wool, treated by hydrochloric acid, leaves only from 0·002 to 0·001 of ashes.

Wool, exposed for two hours to 150°, assumes a yellow color, which acquires more intensity, if the temperature be raised to 170°.

Wool, when heated to dryness at 100°, does not disengage either ammonia or any sulphurous emanation: at 130°, it yields ammonia, and from 146° to 150°, a sulphu-

* *Academy of Sciences*, Sitting of the 20th of April, 1840.

rous emanation, without any perceptible disengagement of gas insoluble in water.

Water favours the development of the sulphurous vapour; for it is sufficient, to recognise it in the vapour which is disengaged, to boil the wool in water. Water containing sulphuric acid, and especially alum, acts less than distilled water.

From the tendency of wool to yield sulphur, it is not surprising that it blackens, especially with heat, by contact with certain metallic bodies, such as the acetates of lead, the proto-chloride of tin, &c.

I may here mention some very singular observations concerning the influence of the contact of certain bodies with wool during the space of four years.

1st. 1 part of wool, steeped in 40 parts of water holding in solution 0·4 of hydrated sub-carbonate of soda, and 0·4 of tin foil being disseminated among its filaments, caused a disengagement of hydro-sulphuric acid and ammonia, and a formation of proto-sulphuret of tin: the wool was very materially altered in its tenacity, and there was formed, at the expense of its elements, a very considerable quantity of a volatile, odorous acid, of which I shall speak farther on.

2nd. 1 part of wool, treated like the preceding, with the exception that lead was substituted for tin, was of a deeper color, but less altered in tenacity: it likewise produced less of the volatile, odorous acid.

3rd. 1 part of wool, treated as above, protoxide of lead being substituted for lead, was colored much more, and was evidently more altered.

It is evident, therefore: 1st, that the contact of tin with wool, in slightly alkaline water, causes a much greater alteration than metallic lead: 2ndly, that the contact of protoxide of lead with the alkalized water caused a greater alteration than did metallic lead in similar circumstances.

I may add that if 1 part of wool be kept in 40 parts of water with 0·4 of protoxide of lead without alkali, it is colored, if not deeper than with it, at least, more uniformly: but it is a remarkable fact, that the tenacity of the wool is scarcely altered, whilst, if there had not been protoxide of lead with the distilled water, it would have lost much of its tenacity.

Another remarkable fact is, that wool left for four years in distilled water, presented nothing at the end of that time, which would indicate a separation of its sulphur, except a slight alliaceous smell: but lead paper suspended in the atmosphere of the flask which exhaled this odour, retained its whiteness. It lost some of its tenacity, but less, however, than the portion which had been in contact with the tin and sub-carbonate of soda. Carbonic acid and ammonia were produced.

The action of protoxide of lead in preserving wool is completely analogous to that which I recognised in magnesia, of preserving pork fat from rancidity.

The altering action of tin in alkalized water may easily be explained.

In treating wool by nitric acid, and by using every possible caution for determining accurately, by means of chloride of barium, the quantity of sulphuric acid produced by the sulphur which it contains, I found 1·78 of sulphur in 100 parts of wool, in the state in which it is used.

II. OF THE FATTY MATTER OF WOOL, AND OF THE THEORY OF FREEING WOOL FROM GREASE.

I will now proceed to detail briefly the experiments which I made, in order to come at the explanation of the cleansing of wool from grease. This operation, carried on in the large way, consists principally in treating, at a temperature of 60° to 73° in general, greasy wool, and, indeed, all the varieties of wool occurring in commerce, by water rendered alkaline by means of ammoniacal urine, sub-carbonate of soda, or soap, to which is often added, an argilo-calcareous milk. After 10, 15, or more minutes, the wool is washed quickly in baskets, or copper vessels perforated with holes, plunged in a stream of water.

I treated by cold distilled water, a kilogramme of merino wool, in the greasy state, until it imparted nothing more to that liquid. The water with which it was first washed was colored, because it had dissolved the foreign matters, and it was turbid because it had withdrawn most of the earthy matter which greasy wool always contains.

Every one is aware that M. Vauquelin considers the grease as a soap of potassa.

Wool washed with cold distilled water until nothing more could be removed from it, had a reddish grey color; it was not very easily wetted. It was evidently greasy to the touch: when pressed between two double Swedish papers with a hot iron, it stained them very much; and the stains did not disappear in the air, because they were produced by a fatty matter which was not evaporable.

The fatty matter, which I separated from wool by means of boiling alcohol, is composed of two immediate principles, corresponding, as regards the difference of their fluidity, to stearine and oleine. It is for that reason that I call them stearerine (the hard fat of wool), and elaierine (oil of wool); but they are absolutely different from stearine and oleine in many of their properties, and especially in that of not being saponified by the alkalies.

Stearerine is perfectly liquid only at 60°, whilst elaierine remains so at 15°.

Both are neutral to colored reagents.

1000 parts of alcohol (density 0·805,) dissolved at 15°, only one part of stearerine and 7 of elaierine. The process, by means of which these two principles are separated from one another, is founded on this difference of solubility.

One part of stearerine and 100 parts of water, heated together, do not make an emulsion, even after cooling, as do the same quantities of elaierine and water.

One part of stearerine and two parts of hydrate of potassa, dissolved in water, and heated to 97° or 99° C. for the space of 60 hours, form an emulsion, but are not saponified.

By distilling stearerine and elaierine with hydrate of potassa, neither ammonia nor sulphur is obtained. They seem, therefore, to be void of azote and sulphur, and to be formed only of carbon, hydrogen, and probably oxygen, united in proportions which I will give hereafter.

If we seek the proportions of fatty matter in wool which has been washed in distilled water and dried at 100°, it will scarcely be believed that it amounts to 20·8, and that some is still retained in the wool. It is, however, the result of an experiment made on two samples of merino wool; one of which was procured from lambs, and the other from full-grown sheep. I am far from affirming that the wools of different breeds ought to contain the same proportion of fatty matter, for this reason, that my experiments relate as yet only to merino wool.

Alcohol separates scarcely 0·03 of fatty matter from wool which has been subjected to the operations of cleansing and of washing in the large scale; whence it follows, that it loses 17 per cent. of it in the operations of spinning and dyeing.

The theory of these operations having never been accurately given, I will explain it as I conceive it, resting on the preceding observations and experiments, to verify the conclusions which I have drawn from them.

If wool be treated only by pure cold water, the soluble foreign matters are separated: as for the fatty matter, it remains fixed in the wool, and retains the most divided earthy parts of the sand, which fleeces always contain; these earthy parts, being more or less colored, deteriorate the whiteness which is proper to wool perfectly washed and cleansed.

In the large way, the water of a boiler is charged with the soluble, greasy, foreign matter, which renders the water alkaline and rather saponaceous, although this matter cannot exactly be assimilated to a soap: the alkalinity of the water is increased with ammoniacal urine, sub-carbonate of soda, or soap: the energy of the alkaline water may afterwards be increased from 60° to 75° in general. The fatty matter then forms with the hot alkaline water, *not a solution*, since saponification cannot occur, *but an emulsion*. This emulsion is separated from the wool, because it is persistent, and its stability is further increased by adding to the cleansing bath a certain quantity of earthy milk, by which the fatty matter is dispersed. Lastly, by means of the quick stirring which the wool undergoes in the baskets, where the water is continually renewed, all the foreign bodies may be separated, and may be removed by a mechanical action, and the soluble matter of the liquid of the boiler which moistened it.

If it be desired to appreciate the influence on the cleansing of the alkalinity of the water, of its temperature, and to be convinced of the necessity of separating the greater part of the fatty matter from the wool, in order to obtain it as white as possible, the following observations must be taken into consideration:—

1st. Cold water containing sub-carbonate of soda forms an emulsion with wool which has been washed with distilled water, whilst pure water does not do so. The first liquid separated from the wool, deposits an earthy matter, and yields much stearerine and elaierine to alcohol: the turbid liquid separated from the evaporated deposit, also yields some to the same solvent.

2nd. Water which has been digested at 75° on wool washed with cold distilled water, becomes emulsive, because a portion of fatty matter, truly very trifling indeed, is disseminated in the water.

3rd. If wool which has been washed in cold distilled water be incinerated, it is found to contain 46-thousandths of earthy matter; whilst, if a sample of the same wool be incinerated after it has been subjected to alcohol and has become white, the ash scarcely amounts to 9-thousandths. Indeed, a proof of the influence mechanically exercised by the fatty matter on the color of the wool, is, that if a few grammes of wool be simply washed in cold distilled water, it will be perceived at the same time that the alcohol dissolves the fatty matter, that the wool is bleached, and that the argilo-ferruginous matter which deteriorated its whiteness, is precipitated.

The following table shows the respective proportions of matters which I have withdrawn from a merino fleece. Their weights were determined at the degree of desiccation effected by a temperature of 100° C.

Earthy matter deposited from distilled water in which wool had been washed		26·06
Dirt dissolved by cold distilled water		32·74
Wool washed with cold distilled water.	Fatty matter composed of stearerine and elaierine .	8·57
	Earthy matter fixed in wool by the fatty matter .	1·40
	Wool freed from grease by alcohol . . .	31·23
		100·00

III. OF WOOL DEPRIVED OF ITS FATTY MATTER.

Wool deprived of its fatty matter, examined microscopically in comparison with wool of the same kind retaining its fatty matter, differs much from it: it presents cylindroid threads, the angles of which are not clear but are loaded with small rugged masses, whilst the second shows cylindroid filaments with transverse striæ, the angles of which are very clear.

Wool deprived of its fatty matter, exposed to a temperature of 160° centigrade, during six hours, comparatively with wool which still contains its fatty matter, assumes a light yellow color, whilst the other samples become brown. Indeed the spun wool which yielded from 2·4 to 2·8 per cent. of fatty matter to alcohol, submitted to the same experiment, as compared with wool which had not undergone treatment by alcohol, was less colored than the latter: but my experiments do not authorise me to attribute to this cause alone, the phenomenon of which I speak.

Since the fatty matter does not contain sulphur, it is evident that wool treated by alcohol ought to exhibit, like that which has not been, all the phenomena of coloring by the metals which act on this sulphur, producing colored sulphurets.

Wool, subjected to the action of alcohol, gave more sulphuric acid when it is treated by nitric acid, than ordinary wool. The first produced 2·22 and the second 1·78: however, I should observe that these results are not exactly comparable, because the wools were of different kinds.

IV. SEPARATION OF THE SULPHUR FROM WOOL.

The fact that wool may lose some of its sulphur without any perceptible alteration in its structure, and the analogous fact, that sulphur may quit it in order to unite with certain metals, with lead, for example, have led me to endeavour, if possible, to separate the sulphur from it. After a few trials, I submitted the wool to the following treatment. Unfortunately I was obliged to take a spun wool different from the merino wool of which I availed myself in the experiments detailed in II. and III.

1 part of wool, ¼ of lime, and 40 parts of water, were macerated together for 48 hours.

The wool was washed, and wrung, then treated by dilute hydrochloric acid, and again washed and wrung.

The lime separated the sulphur in the state of sulphuret of calcium and the hydrochloric acid again disengaged hydro-sulphuric acid from the lime.

The wool did not show any sign of being weakened until the eleventh treatment. It underwent 28 macerations of 48 hours each, and was treated 28 times by hydrochloric acid. The whole of the operations lasted six months.

V. ON WOOL SEPARATED FROM ITS SULPHUR.

Wool which has been subjected to the desulphuring action of lime is much weakened in its tenacity. Examined with the microscope in comparison with a sample of wool containing sulphur, instead of exhibiting, like the latter, cylindroid filaments with clear, rectilinear angles with transverse striæ, the desulphured wool presented many flattened filaments ragged at the edges, with longitudinal striæ, which would seem to indicate that the interior of these threads had been exposed by the numerous wringings which the matter undergoes in the chemical action.

Wool separated from its sulphur yielded only 0·005 of ashes.

Boiling alcohol separated from it 2·82 of fatty matter, while from the same kind of wool which had not been deprived of its sulphur, only 2·4 was extracted: the variation was probably owing to the difference of the state of physical division of the two samples.

The desulphured wool, even that which had been submitted to the action of alcohol, assumed, by the action of a temperature of 160° C., kept up for six hours, a much more intense orange colour than wool which had not been desulphured.

Lime did not deprive the wool of all its sulphur; for by treating it with nitric acid, it was proved still to contain 0·46, instead of about two parts, which it contained previously. However, it is easy, by comparative experiments, to perceive that desulphured wool is not colored, or at any rate, only very slightly, by the metallic bodies which color ordinary wool powerfully.

VI. DEDUCTIONS FROM THE ABOVE EXPERIMENTS IN A MANUFACTURING POINT OF VIEW.

In remarking to the Academy, at its sitting of the 26th of December, 1837, the

serious inconvenience arising from the presence of copper in wool intended to receive designs, of which the colouring matter must be fixed by steam, and afterwards appear on white or very light colored grounds, I did not point out, in a positive manner, the chemical condition of the copper in such cases: I now show that the metal, under the influence of steam, combines with the sulphur, and produces with it an orange brown sulphuret.

I would call the attention of manufacturers to the necessity of keeping copper tools and preparations away from wool intended to receive light colors.

Experiments should be tried in order to ascertain accurately the influence which the fatty matter of wool, simply cleansed with pure water, exerts in spinning, comparatively with the influence of olive-oil added to wool which has been perfectly freed from grease before spinning.

VII. DEDUCTIONS FROM THE ABOVE EXPERIMENTS IN A PHYSIOLOGICAL POINT OF VIEW.

I insist on the analogy between the two immediate principles of the fatty matter of wool, and those of the fats of the cutaneous tissue, in this respect, that stearerine and elaierine differ from one another in fusibility, precisely as margarine and stearine do from oleine: but at the same time I would remark, that the property of being saponified, which the three latter principles possess, sufficiently distinguishes them from stearerine and elaierine.

I insist also on the presence of sulphur in a compound still unknown, which is distinct from the filamentous part of wool, and which is intimately combined with it. I have remarked that under the influence of heat, of alkalies, and of certain metals, this sulphur leaves the wool, and that from being latent, it becomes perceptible, whilst it retains its latent condition for whole years in wool steeped in distilled water.

Finally, it would appear, considering the latent state of the sulphur in albumen and wool, that the opinion of Mr. Hatchett, who regards the latter substance as coagulated albumen, may not be utterly improbable.

ON A PROCESS FOR GILDING METALS WITHOUT THE INTERVENTION OF MERCURY, BY ELECTRO-CHEMICAL ACTION.

BY PROFESSOR DELARIVE.

Observing the injurious effects of employing mercury in gilding, I had long been of opinion that the decomposing power of the electric current, applied to a solution of gold, might, by bringing that metal, particle by particle, upon the object to be gilt, be substituted in many cases, if not in all, for the use of mercury. The first experiments which I made with this view were fifteen years ago: they were not successful, and I then ceased to apply myself to this subject. The investigations which, since that period, have been made in electricity, and above all, the numerous important discoveries of M. Becquerel, have induced me to make new experiments conducted in a rather different manner: and I think I have arrived at a process which, if not quite perfect, is, at all events, of a nature to furnish very useful results, and to become, in the hands of the experienced, of universal and advantageous employment.

The principles by which I have been guided in this application of the decomposing power of the electric current to the gilding of metals, are as follows:—

1st. The employment of weak electrical power to effect decompositions when we desire to obtain a regular and uniform deposit of the particles of one of the elements of the liquid which is decomposed, namely, of the particles of the gold which is in the state of a chloride in solution.

2nd. The employment of a diaphragm of bladder to separate two solutions placed one after another, in the same electric circuit, in order to avoid their being mixed, without preventing the electric current from traversing them successively. One of these is the solution of gold: the other is water slightly acidulated, which is used to produce the current by its action on a sheet of zinc steeped in it.

3rd. The third principle is the property which the electric current possesses, of passing with greatest facility from a liquid into a metal, and *vice versâ*, when the metal is most susceptible of being chemically attacked by the liquid. In the present case, the metal which is steeped in the solution of gold is more attackable by the liquid than the gold itself: from this it results that the immerged part will not be entirely gilt, the current will seek the points where the metal is still bare, to traverse them and deposit the gold in them, whatever may be the length of the course which it has to pursue in the liquid, or however irregular and complicated may be the object which we desire to gild.

The following is the mode in which, after various experiments, I have been enabled to apply the three preceding principles to gilding: the first two are due to M. Becquerel; and the third was explained for the first time in a memoir which I published in the *Annales de Chimie et de Physique* for 1825.

I pour a solution of chloride of gold, as neutral as possible, and very dilute (5 to 10 milligrammes per cubic centimeter of the solution), into a cylindrical bag, made of bladder: I put this bag into a glass matrass, containing very slightly acidulated water. The object which I wish to gild communicates, by means of a metallic wire, with a plate of zinc, is steeped in the acidulated water, and is itself placed in the solution of gold. If desired, the acidulated water and the zinc may be put in the bag of bladder, and the solution of gold and the object to be gilt, in the glass matrass. In about a minute, the object may be withdrawn and wiped with a fine cloth; by rubbing it with this cloth it is found already to be a little gilt; after two or three similar immersions, the layer becomes so thick that it is unnecessary to continue the operation any longer.

I shall not enter into a detail of all the precautions indispensable to success: I will content myself with pointing out a few of them.

The electric current must be very weak: we should avoid, as much as possible, a disengagement of hydrogen on the object to be gilt, which too great an intensity of current might cause, as, if it were too abundant, it might prevent the gold from depositing solidly. Consequently, only a few drops of sulphuric or nitric acid must be put into the water in which the zinc is steeped, and this metal must not be sunk lower than just enough to establish a sufficient current, which, with a little practice, may easily be attained.

The object which is to be gilt may previously be scoured and polished with care, or simply scoured. In the first case, after the operation, it has a brilliant gilding, which seems to have been submitted to the action of burnishing: in the second, the gilding is dull; it resembles that obtained by withdrawing from the fire objects which have been gilt by amalgam: perhaps the layer of gold is thicker; what leads me to suppose so is, that a greater number of immersions are required to effect the gilding. In both cases, it is equally necessary to scour carefully, and above all, to free from grease, and to cleanse, the object to be gilt: it is also right to wash it in slightly acidulated water every time it is withdrawn from the solution, before wiping and rubbing it, and even after it has been rubbed, before it is again immersed. A very good means of scouring it consists in making it communicate for a few minutes, in acidulated water, with a piece of zinc which, forming with it a couple, determines on its surface an abundant disengagement of hydrogen.

The color of the gilding seems to depend on several circumstances: on the quality of the gold which is dissolved, on the nature of the metal to be gilt, and on the degree of concentration of the solution of gold. The previous polishing of the surface, or its omission, seems also to affect the color: when it has not been polished beforehand, the gilding is much more red, which probably is attributable to the gold being deposited on a rough and not quite level surface; their mutual inclination causes a play of light similar to that which takes place in the interior of a gilt vessel: it is very curious that burnishing does not destroy this effect.

It is necessary to be very careful that the object to be gilt should not be put in contact with the solution of gold until everything is arranged, so that the electric current may take place only when this contact is established; otherwise, the direct action, without a current, would prevent the gilding from taking place properly, especially if silver were being operated on.

This process appears to me very economical. Everything except the gold is very cheap: and as for the gold itself, very little is required for a tolerably beautiful gilding. I have gilt ten silver spoons with a solution containing 800 milligrammes of gold. Supposing that the gilding of the ten spoons took up all the gold in the solution, which, however, was not the case, each spoon would have taken up 80 milligrammes of gold—that is to say, for about 32 centimes, (rather less than threepence English,) taking the price of gold at 4 francs (about 3*s.* 1½*d.* English) the gramme of fine gold, which is rather high. It is true that the gilding was not very thick: it was of the fine greenish-yellow called English gold; however, it resisted repeated frictions. A temperature of 300° or 400° did not alter it; it only made it penetrate farther into the surface of the metal: but a single gilding, over the first, produced a very thick layer, which probably was very durable.

By means of the process which I have just described, I have gilt wires, plates, silver coffee spoons, and brass watch-cases: I have succeeded also in gilding some watch wheels: the extremities of the teeth were well gilt, but the color was not such as watchmakers prefer: it was too red. I am now endeavouring to discover the means of rendering it yellower and more dull (*mate*). It appears to me, that every object, of whatever form, may be gilt by this means. A surface may also be partially gilt, either by covering with wax the parts which are not to receive the gilding, or by spreading the solution of gold, with a pencil, on the parts to be gilt. Thus may be produced on a surface, by gilding, traces whose outlines form letters or figures.

In conclusion, I may add, that since the completion of my work, I have been made acquainted with a process used in Germany and England for gilding with a solution of oxide of gold in potassa. This process, which has not been generally adopted, requires the employment of a high temperature, whilst the electro-chemical one does not. It does not present the advantage, like the latter, of removing the oxygen and chlorine from the gold, and of preventing them from attacking the object to be gilt, as is the case with the electro-chemical process, which, by the power of the electric current, transports them to the zinc in the acidulated water. Moreover, the purely chemical process produces only a tarnished and dull gilding. I consider it also less economical: indeed, it appears to me to present many more inconveniences than the electro-chemical process: of which, however, practical men will be the best judges. Be it as it may, experience will decide which of the two processes has the superiority. What has encouraged me to make mine public is, even should it have but a partial application, that I have observed that the purely chemical process seems to be abandoned, and that that which is founded on the employment of mercury continues to be made use of in many cases, in which, as I have already ascertained, the electro-chemical method might be substituted with advantage.

ON LINSEED OIL AND LINSEED OIL VARNISH.*

BY JUSTUS LIEBIG.

It is on the property which linseed oil possesses, of being gradually transformed into a brilliant and drying substance, that its important employment in the arts and in painting is founded.

The rapidity with which this change, this desiccation of linseed oil, is effected, depends partly on its age: recent linseed oil requires a longer time than old oil, which has formed a deposit. This transformation may, as we know, be greatly accelerated by boiling linseed oil either alone, or with the oxide of lead or of zinc: in this state it is called linseed oil-varnish. This varnish is more or less colored, and thicker than the oil used to prepare it: in the space of twenty-fours it is converted on glass plates at the ordinary temperature, into a non-glutinous layer as shining as glass; whilst linseed oil requires eight or ten days to undergo the same alteration.

The modifications which linseed oil undergoes in passing to the state of varnish, have been very little studied; according to the most common opinion, the oxide of lead partially reduces it. The oil seizes the oxygen and oxide of lead, and thus undergoes, during the preparation of the varnish, some of the modifications, which could take place in the air only after a greater lapse of time.

According to investigations which I have undertaken concerning the preparation of varnish, this opinion is unfounded: it would appear, on the contrary, that the transformation of linseed oil into varnish is based on the elimination of substances which oppose oxidation. My experiments have not been made with the object of discovering the cause of the alteration which linseed oil undergoes in its contact with oxygen: they are confined to the action of oxide of lead on linseed oil, and to the best mode of preparing varnish.

Saussure's experiments on the action of oxygen gas on drying oils, show an extraordinary difference with respect to the time of the absorption of oxygen; this absorption is, as it were, operated by fits. A layer of nut oil, for example, absorbed in eight months only three times its volume of oxygen; at the end of this time he observed an increase, disproportionate in rapidity, which was such, that the same layer had, in the ten days following, absorbed twenty times as much oxygen as in the eight months previous.

This extraordinary phenomenon can be explained only by the presence of a foreign substance, which being dissolved in the oil, prevents the contact of the oxygen, and which undergoes an oxidation similar to that of the oil, although more slowly. I shall not decide whether this substance should be called mucilage; it results, at all events, from the vegetable albumen of the seed employed for the extraction of the oil.

The action of oxygen on the oil itself must be prevented by this mucilaginous matter; it may be represented as enveloping the particles of oil, and neutralizing their property of absorbing oxygen, until it is itself destroyed.

The following investigations will, perhaps, be sufficient to justify the opinion which attributes the transformation of linseed oil into varnish, to a purification of the oil, the sole condition of its property of solidifying in the air.

If mere boiling augments, as we know it does, this property, it is still farther increased when we add to the boiling oil oxide of lead, acetate of lead, or oxide of zinc. Boiling at a high temperature gradually destroys the mucilage: there occurs a solution of oxide of lead, and the formation of a compound which remains dissolved in the excess of oil.

* *Annalen Der Chemie und Pharmacie.*

Both pure boiled linseed oil, and linseed oil with oxide of lead, dry very rapidly in the air; but the latter seems to possess this property in a much higher degree. It is, I think, a mistake, inasmuch as the judgment refers to the state of viscosity, which both assume, by exposure, in thin layers, to the air. Linseed oil, boiled with oxide of lead, is thicker, and holds in solution a solid combination, whose separation naturally renders the oil, which thickens, more glutinous than linseed oil submitted only to boiling.

I supposed at first, that the formation of varnish was owing to saponification, or to a destruction of the glycerine; the one caused by oxide of lead, and the other, by elevation of temperature.

This opinion seemed to be justified by the fact, that linseed oil heated to 100° centig., mixed with litharge, and through which steam was passed, for the space of an hour, was converted into an excellent varnish, which dried quickly and easily in the air, and was but slightly coloured. But when a mixture of linseed oil with litharge and water was boiled for a longer time, a thick mass was obtained, which dried with great difficulty in the air, and retained, for a long time, an unctuous consistence. To remove all doubt that saponification is not necessary to the formation of varnish, I saponified linseed oil with caustic potassa, and separated the oleic acid formed by hydro chloric acid. The oleic acid extracted from the soap of linseed oil is a thick oil which becomes a crystalline mass at 10—12°. When the solid portion is separated by filtration, at a rather high temperature, about $\frac{1}{10}$ of a white solid body is obtained, which easily dissolves in hot alcohol, and is deposited from it in fine needles, in the same manner as margaric acid. This liquid oleic acid does not dry in the air more readily than linseed oil; it dissolves, with the assistance of heat, a great quantity of oxide of lead, and when it is saturated with it, takes the consistence of a plastic mass.

When there was dissolved in it such a quantity of oxide of lead, that it might still preserve its liquid state, after cooling, a compound was obtained, which was identical in its properties with linseed oil boiled for several hours with water and litharge, that is to say, not varnish.

From the above, it results that the formation of varnish is independent of the separation of the glycerine from the oil; and that, on the contrary, this substance partakes of drying properties.

The following researches have shown me that the simplest and best method of preparing varnish is by means of subacetate of lead.

If linseed oil be carefully mixed, by stirring, at the ordinary temperature, with subacetate of lead, and the mixture be allowed to clarify by standing, a great quantity of a white slimy deposit, containing oxide of lead, is separated; the supernatant oil is converted into an excellent varnish; it has a yellowish color; and when it is spread in thin layers, it dries perfectly in twenty-four hours, and contains in solution, from 4 to 5 per cent. of oxide of lead. The following proportions are well adapted for its preparation in the large way. There are poured into a suitable vessel on 500 grammes of subacetate of lead, 2,500 grammes of rain-water, and when the solution is completed, 500 grammes of finely levigated litharge are added: the solution of the litharge may be accelerated by exposure to a moderate heat, and by frequent stirring: when no more bracteæ of litharge can be seen, it may be considered as finished. There is formed in this operation a brilliant white deposit, which may be either left in the liquor, or separated from it by filtration. Solution may be effected in a quarter of an hour by boiling; but if no heat be employed, the mixture must be left to itself for several days.

The solution obtained serves for the preparation of 10 kilogrammes of varnish: it is diluted with its own volume of water; and 10 kilogrammes of linseed oil, into which 500 grammes of levigated litharge have been distributed, are added by degrees, stirring frequently. By renewing, three or four times, the contact of the lead solution with the oil, by repeated stirrings, and then leaving the mixture to clarify in a warm place, the yellowish and clear varnish is obtained floating on the aqueous liquor, in which is found the white deposit, and of which there has been a question. The filtered aqueous solution contains all the acetate of lead first employed: it may be used for all subsequent preparations, instead of a fresh solution of acetate of lead, after 500 grammes of litharge have again been dissolved in it.

To obtain limpid varnish, it is necessary to filter it through coarse unsized paper, or through cotton: there is then separated from it a white powder, which is but very slowly deposited by standing. It may be bleached by exposure to the sun. If a varnish free from oxide of lead be required, it is sufficient to stir in a little dilute sulphuric acid, and to leave the liquor to stand: sulphate of lead is then separated from it, and the varnish, free from lead, floats above; it is limpid and in a state of purity.

RESULTS OF M. PLAGNE'S INVESTIGATIONS CONCERNING THE COMPOSITION OF THE JUICE OF THE SUGAR CANE.*

EXTRACT OF A LETTER FROM M. COLIN.

In a recent work, (see *The Chemist*, No. V., p. 148,) M. Peligot considers the juice of the *Arundo Saccharifera* as water containing sugar, wherein the saccharine matter, which is quite crystallizable, amounts to 18 or 20 per cent. This, as MM. Robiquet and Guibourt have remarked, is precisely the same conclusion as that drawn some years ago by M. Avequin in his investigations concerning the composition of the sugar cane.

M. Plagne, one of my old assistants at the Polytechnic School, arrived at the same results in 1826. His experiments, communicated in five addresses to the Minister of Marine in 1827, show:—

That the juice of the *Arundo Saccharifera*, both from Martinico and from the coast of Coromandel, contains more than 20 per cent. of crystallizable sugar, and that the whole of it might be obtained, provided that it were evaporated at a temperature not exceeding 100° C.

That by operating thus, little or no molasses is obtained.

That this rapidity in evaporation is the more desirable, because the juice of the sugar-cane contains a matter which, if done slowly, would transform the whole of the sugar cane into a viscous substance.

I shall presently revert to the nature of this ferment; but I must first communicate the result of M. Plagne's analysis of the juice: he operated on four thousand grs.:

Water	3133
Crystallized sugar . . .	832
Uncrystallizable dry residue .	30
Cerine	0·30
Green Wax	1·06
A peculiar organic matter .	1·61
Dry albumen	0·30
Total . . .	3998·27

Differing but 7 decigrammes from the four thousand grammes used for the experiment.

The peculiar organic matter which was observed by M. Plagne in the juice of the *Arundo Saccharifera*, and which does not amount to a two-thousandth part of it, is that which transforms the sugar into a viscous matter, when its evaporation is not proceeded with immediately, or is carried on too slowly.

M. Plagne discovered in it the following properties: it is white, turning brown on exposure to the air; soft, attracting moisture slightly, and drying difficultly. It is insoluble in alcohol and in ether, soluble in water, not azotic, burning without turgidity, with a smell resembling that of extract of chicory. The salts of protoxide of mercury and lead precipitate it from its aqueous solution; perchloride of mercury does not affect it; and alcohol and ether separate it with its primitive properties, from water which has dissolved it. Animal charcoal combines with it; but for this purpose, it is necessary to increase its quantity, and to put a portion of it in the juice at the moment it flows from the cane, in order to prevent viscous fermentation.

The viscous matter into which sugar may be transformed by the substance which has just been described, does not yield carbonate of ammonia by distillation, whence it may be inferred that it does not contain azote. Water dissolves it, and alcohol precipitates it from the aqueous solution: it has, therefore, the properties of gum; however, treated by nitric acid, it yielded only oxalic acid. Is not this matter analogous to that which M. Peligot has obtained from certain fermentations, and which he has considered, I believe, as anhydrous sugar?

May not the sort of ferment noticed in the juice of the cane be the same as that observed by M. Bracconnot in the tubercles of the helianthemum?

* *Comptes Rendus*, No. 13.

ON MR. TALBOT'S PHOTOGENIC DRAWINGS.*

BY M. BIOT.

I have the honour, on the part of Mr. Talbot, of presenting to the Academy, forty photogenic drawings, produced under various circumstances upon sensible papers. Some were obtained by application, others by direct action in the camera obscura. Their execution appears to me at least to equal every thing of this kind, which has hitherto been presented, especially considering that many of them, and some of the most satisfactory, were executed under all the disadvantages of the present season. Mr. Talbot has not communicated to us his process, not with the intention of making it a mystery, but because he hopes to increase its sensibility, and because he awaits the return of fine weather to enable him to realise the improvements which he has in view. The results, such as they are, already present many indications which are very valuable in physics: and, in order that they may be better understood, I will pre-

* *Comptes Rendus*, No. 13, March 23, 1840.

cede the exhibition of the drawings by a few remarks which have been suggested to me by their inspection, or which I have found in Mr. Talbot's letters.

It is not to be expected that photogenic drawings, made on paper, can ever equal the clearness and fineness of those obtained on level and polished metallic plates. The texture of paper, its superficial roughnesses, the depth of the imbibitions, and the capillary communication established between the various unequally marked parts of its surface, are so many obstacles to absolute strictness of delineation, as well as to the regular gradation of tints in the camera obscura; and the influence of these obstacles is greater when the chemical operation is slowly carried on. But when there is no pretence or necessity for submitting to the delicacies of art, when it is required, for example, to copy rare manuscripts faithfully, if we have papers which are very susceptible of receiving impressions in the camera obscura, they will suffice perfectly; particularly when they present, like those of Mr. Talbot, the facility of immediately procuring copies of the primitive drawing. It will therefore, doubtless, be found more commodious, and often even more practicable, to put four or five hundred drawings in a portfolio, than to carry about a similar provision of metallic plates with squares of glass to cover with these indispensible protectors, perfect prints, it is true, but which are as light as the vapour from which they are produced; and, indeed, to bring the voluminous collection of these fragile products through the accidents incident to long, difficult, and sometimes perilous voyages. Attempts are being made, at this time, to fix the images produced by the Daguerreotype. But whoever has attentively studied the combination of physical conditions whence these admirable images result, will find it very difficult, I am far from saying impossible, to fix them without destroying, or at least without essentially altering the causes which produce their charm: and then, for the purposes which I have mentioned, papers very susceptible of impression would still have the advantages of a less troublesome removal from place to place, as also of more easy preservation.

The utility of sensible papers for copying texts was a natural consequence of the clearness of the copies of engravings which Mr. Talbot had already obtained by application, and which were presented to the Academy. He has included others among those just sent: there are also added specimens of this especial application, consisting of copies of a Hebrew psalm, of a Persian *Gazette*, and of an old latin chart of the year 1279. Our brethren of the *Academie des Belles Lettres*, to whom I exhibited these impressions, were pleased to remark the fidelity of the characters, and their clearness, by which they are rendered as legible as the original text. Doubtless an old manuscript may be copied more quickly and more accurately by this means than by hand, even when the language in which it is written is understood. However, we must stop here. These copies are obtained by application: we must be enabled to obtain them by immediate radiation in the camera obscura. It is the only means of extending the process to papyrus and other opaque manuscripts, or which are not sufficiently transparent for radiation to traverse them. Moreover, the application of leaves is very difficult when they are bound up in a volume, and cannot be detached from one another.

But this important extension will require much physical perfecting, towards which experimenters should direct their efforts. The first thing will be to augment the sensibility of the paper as much as possible, in order that the capillary communication of its various parts may not have sufficient time to deteriorate the effects of the local and immediate action of the radiation. I should be led to believe that it is principally to this kind of communication should be attributed the fact remarked by Mr. Talbot, that in experiments by application, it is more difficult to copy clearly a tissue of black lace spread on a white ground, than white lace on a black ground, two cases, of which he here gives examples. But another more hidden and more general difficulty seems to me to proceed from the unequal faculty of various substances, for reflecting the radiations which strike them, and perhaps from their aptitude for making them undergo physical modifications. For example, you wish to copy by radiation in the camera obscura a picture painted on canvas, wood, or porcelain: the different coloring substances employed by the painter are placed and distributed in such a manner that each of them absorbs certain portions of total incidental light, and reflects especially towards your eye the complementary portions, wherein predominate the rays proper to form the tint of which it would give you the sensation. But the chemically active reaction which the same parts of the picture receive and reflect is distinct from the light which affects your retina.* In order that the chemical effect which it produces on the sensible paper, or on M. Daguerre's layer of iodine, may present in light, or in shade,

* I presume that the reader admits this as a fact established by the experiments which I published in the *Comptes Rendus* for 1839, 1^ere^ sem.

the equivalent of the colored shades, it is requisite, 1st, that this reflected radiation be chemically active: 2nd, that the energy of its action be proportional to the intensity of illumination operated in the eye by the portion of luminous radiation reflected from the same point of the picture. Now this latter concordance certainly should not be fulfilled in an equal degree, by the various coloring matters, which affect the eye in the same manner, and which the painter may substitute for one another in his work. Substances of the same tint may present, in the quantity, or the nature of the invisible radiations which they reflect, as many diversities, or diversities of the same order, as substances of a different tint present relative to light: inversely they may be similar in their property of reflecting chemical radiations, when they are dissimilar to the eye: so that the differences of tint which they presented in the picture made for the eye will disappear in the chemical picture, and will be confused in it in a shade, or an uniform whiteness. These are the difficulties generally inherent in the formation of chemical pictures; and they show, I think, evidently, the illusion of the experimenters who hope to reconcile, not only the intensity, but the tints of the chemical impressions produced by radiations, with the colors of the objects from which these radiations emanate. However the distant or near relations of these two species of phenomena are very curious to study, not only as regards the photogenic art, since that name has, very improperly, been given it, but likewise as regards experimental physics. I doubt not that examples may be remarked in the images of natural objects and colored pictures executed by the Daguerreotype; but very apparent ones may be seen among Mr. Talbot's present impressions. Thus, some of them represent white porcelain vases, colored shells, a candlestick (of metal) with its taper, a foot of white hyacinths. The whole of these objects are felt and perceived very well in their chemical image: but the parts which reflect the purely white light, probably also the radiations of every kind, are, relatively to the others, in an exaggerated proportion of illumination, which, it seems to me must result, partially, from the capillary communication during the continuance of the action, so that the inequality would be less if the paper were more sensible or more rapidly acted on. In the hyacinth, the stalk and the green leaves produced scarcely a faint trace of their configuration; and they produced it especially in the parts of the outline where more or less perfect specular reflection is operated. The points of the candlestick (metallic) where this reflection occurred, are copied by white stains locally applied, and which deteriorate the effect of the whole by their disproportion. But that is seen especially in a picture by Correggio, the frame of which was very vividly copied, whilst the figure on the canvas was hardly perceptible. This disproportion of lustre in the reproduction of some white parts, especially when they are dull and consequently very radiating, is sensible in certain parts of views taken by Mr. Talbot, to the point of rendering difficult the interpretation of the object to which they belong. However, these views are very satisfactory, as being obtained on paper, in the present season. Moreover, by an advantage peculiar to the chemical preparation which Mr. Talbot uses, it appears that the operations once completed, the drawings are no longer alterable by radiation, even acting with much energy. Indeed we have here as an example, four proofs of the same view of Mr. Talbot's house, with an identical disposition of lights and shades: so that some, at least, if not three out of four, must have been procured by superposition. Mr. Talbot is right in representing this property of reproduction as an especial advantage of his process, and it would indeed be very useful in voyages. I have exposed one of these drawings to the action of the sun, not very powerful, it is true, for several hours; and I have not perceived the slightest alteration in the lights. I think I understand that, in Mr. Talbot's opinion, the shades alone are strengthened under this influence. According to what I have just said, it should be expected that the triumph of this process, as of every other photogenic reproduction, would take place with objects of white and dull plaster. Indeed, Mr. Talbot's parcel contains eight copies of busts and statues; six of which chiefly, of various forms and sizes, present very remarkable results, especially taking into consideration the unfavourable season at which they were produced. Truly, there is not found in them the strict perfection of trace, nor the admirable gradation of lights and shades which constitutes the charm of M. Daguerre's impressions, and I again repeat it that my expressions may not be exaggerated. But I also repeat, that representations on sensible papers must be considered as principally applicable to a different object, which does not impose such strict conditions of art, requiring only faithful images, sufficiently clear in their details to be readily recognised, and which, moreover, being obtained with rapidity, by an easy manipulation, may be kept with very little care, comprised in great number in a small compass, and moved from place to place with facility. Mr. Talbot's papers already present many of these essential qualities, with the advantage of being able to furnish numerous copies im-

mediately. His efforts, and those of others occupied with the same subject, will conclude by adding to them every thing which may be desirable, provided that expectation, or the pretension of a perfection of art physically incompatible with operations on paper, do not give a false direction to their endeavours. However, not to appear to despair too much of the future, I may add that the height of success would consist in discovering a substance very susceptible of receiving impressions, which might be applied on a papyraceous leaf without penetrating deep into it, and which might, however, be fixed in it after the operation, as in Mr. Talbot's impressions. It does not seem necessary even that the first impression thus rapidly obtained, should copy the lights and shades in their proper places, provided that its transparency and fixedness were such, that we might deduce them from the application of copies wherein the inversion would be corrected. And perhaps, by this decomposition of the problem into two successive operations, one of the best ways is opened by which it may be resolved.

FIXATION OF PHOTOGENIC IMAGES ON METAL.*

In reference to a passage in the preceding article, respecting the little chance of success in attempts to fix photogenic images on metal, M. Arago remarked that these experiments, though of recent date, had yielded results which were far from discouraging, and that an impression presented by M. Fizeau announced a new advance. Indeed, if in the impressions which have just been exhibited to the Academy, the drawing, although retaining its fineness, appeared to have lost lustre, the same reproach cannot be attached to those of M. Fizeau, which is not inferior in vivacity to the most beautiful images produced by the Daguerréotype, and which, however, has acquired, by means of the operation of fixing, sufficient solidity to allow of its being kept without any other precautions than those required by ordinary drawings.

M. Fizeau asserts that the operation to which he submits the photographic images, far from rendering them pale, has, on the contrary, the property of increasing the vigour of the shades and the brilliancy of the lights.

* Academy of Sciences, sitting of the 23rd March, 1840; from *Comptes Rendus*, No. 12.

PHOTOGRAPHY.

At the sitting of the Academy of Sciences, on the 13th of April, M. Séguier, in the name of M. A. Masson, presented several Italian landscapes obtained by photographic processes, and a copy, obtained by the same means, of an oil painting (a Madonna by Raphael). M. S. observed that all these impressions were obtained on plates prepared by a simple scouring with acidulated water mixed with tripoli, without oil polishing and without heat. He added that the exposure of the plates in the camera obscura had in no instance been continued beyond ten minutes, and that sometimes four minutes had been sufficient.

III. PHARMACY, &c.

ON THE PREPARATION OF SANTONINE.*

BY M. A. GUILLEMETTE.

Having lately had occasion to prepare santonine for pharmaceutical purposes, I had recourse to the processes described by MM. Kœhler and Merck. One of these consists in treating the seed by sulphuric ether, distilling this tincture, and redissolving the crystals formed in ether; and finally in purifying them, and dissolving them in alcohol, to which a little hydrochloric acid is added. The other consists in submitting semencine to the action of hydrate of lime and alcohol, distilling the tincture to one-fourth, filtering in order to separate the residue, then in treating with the assistance of heat, the alcoholic extract by concentrated acetic acid, which, on cooling, allows santonine to crystallize. After having repeated the solutions and crystallization in alcohol mixed with charcoal, it is obtained in a state of purity.

These processes succeed very well, and allow nearly all the santonine to be extracted from the semen-contra; but they appeared to me very expensive.

Several German physicians having dis-

* *Journal de Pharmacie.*

covered in this substance very decided vermifuge properties, in doses of 30 or 40 kilogrammes, I thought it might not be uninteresting to publish an easy and less expensive method of obtaining it, and to put physicians and physiologists in a situation to judge of its medical uses. I wish, in calling attention to it, to see it one day used as a medicine for children, to whom its nature allows it to be administered with facility.

The chemical properties of this substance are very remarkable, and have been very well studied by the chemists who have made us acquainted with them. It occurs in beautiful crystals, which are elongated quadrilateral tables: its solutions have a bitter taste. It is neither alkaline nor acid: however, it combines very readily with bases, and gives with lime, baryta and oxide of lead, crystallizable salts. When a mixture of santonine, lime, water and alcohol is heated, the liquor becomes red; and when it is cooled again, the salt crystallizes in red silky needles, which become white spontaneously. I shall profit by the facility with which I am now able to obtain this substance, to study its properties farther. If my experiments give any interesting results, I shall have the honour of submitting them to the Society of Pharmacy.

The following is the process which I have found most successful: 2,000 gr. of semencontra of Aleppo were reduced to a rather fine powder, made into a paste with cold water, and submitted to pressure after eighteen hours' maceration. The pulverized cake was again set to macerate, and pressed eighteen hours afterwards. The expressed matter, dried, and pulverized, was put in contact with alcohol at 89° cent. and pressed after twenty-four hours' maceration. This manipulation is continued until it is exhausted.

The alcoholic solutions were mixed together and filtered, then distilled in a sand-bath to about 350 grammes. This tincture, left in a capsule, very soon allows all the santonine which it contains to crystallize. One part adheres to the capsule: the other remains mixed with resin, volatile oil and chlorophyle. It may be separated from these substances by decantation, and by squeezing the crystals in a piece of linen. They are purified with boiling alcohol and charcoal. Two crystallizations are sufficient to obtain it pure.

A kilog. of seed yields nearly 4 drachms of santonine.

CASE OF POISONING BY COLCHICUM SEED.*

BY DR. NEUBRANDT.

Caspar B., of Acsthausen, aged 52, of a sanguine temperament, drank by mistake, on the night of the 18th of February, 1830, some of a decoction made with a large spoonful of colchicum seed and three pints of water: he had, in the night, more than 15 stools and vomitings. When Dr. Neubrandt saw him next day he was in a disturbed state. The stools and vomitings were less frequent: the patient, although weak, did not complain of any pain, and could raise himself: the abdomen was not distended, and it contracted spasmodically on being touched: the pulse was small and subfrequent: the stools, which were very fetid, contained small whitish membranes. The patient was made to drink a great quantity of warm water containing butter. This drink provoked vomiting and stools: immediately after, coffee was ordered, and a strong infusion of marshmallow with lemon juice. Except the vomiting and stools, no symptom could be discovered which could make us suspect an absorption of any part of the poison. Next morning, the 20th, at 8 o'clock, the physician found his patient in the following state:—

Face pale, respiration precipitate, groans, hoarseness, eyes sunken, pupils much dilated, tongue covered with a whitish matter, and could be put out only with difficulty: region of the stomach rather painful, breath, face and extremities cold: pulse very frequent, scarcely perceptible: no thirst: stools more frequent since the evening, and containing matters of a light blue color. The patient took, with pleasure, some mucilaginous soups and coffee. Although he replied correctly to questions addressed to him, his intellectual faculties seemed to be confused.

Death at ten o'clock.

AUTOPSY, 23 HOURS AFTER DEATH.

Countenance unaltered, pupils much dilated, eyes sunken, mouth spasmodically closed: a remarkable striped appearance of all the members and muscles: the abdomen scarcely more swelled than during life, was of an extraordinary hardness, and showed peculiar stains, more numerous in the cavity of the stomach and at the sides, towards the back: they were violet, greenish blue, striped, not circumscribed. The muscles were of a deep blue, when dried in the air. The trachea, towards the bifurcation, was inflamed. The lungs, collapsed, small, pale, and soft to the touch, were in

* *Medicinisches Correspondenz-Blatt.*

the normal state internally on the heart, otherwise normal and containing much coagulated blood, were large black, violet and brownish spots. The œsophagus was brownish red only to below the diaphragm and at its opening into the stomach: the cardia, especially, was of a violet black color. The stomach at its exterior surface was of a light violet, and much deeper at the interior: the veins of the stomach and other intestines were greatly distended by perfectly black blood. The liver, in normal state, had a violet tint at its concave surface: the gall bladder was bulky and full of green bile. The large and small intestines were hardly inflamed without, and showed only a few red, brownish spots within. The other organs presented nothing abnormal. The brain and the vertebral column were not opened.

Cases of poisoning by colchicum, without being very rare, are seldom published by those who have observed them: the case which we have quoted above offers this peculiarity, that the symptoms, by no means alarming at the commencement, did not become serious until towards the third day. We must, therefore, be on our guard in similar cases; and we cannot accumulate too many observations to compare with the facts furnished by toxicological experiments on animals.

We find in the same journal (*Medicinisches Correspondenz-Blatt*) another case of poisoning by the leaves of colchicum: the individual died; but the treatment which was followed perhaps hastened death. Autopsy was not made.

LEECH MONOPOLY.

To the Editor.

Sir,—Although the "Leech," as regards its nature, habits, &c., belongs more to natural history than to chemistry, I trust you will admit this enquiry into your columns, in the hope that some information on the subject may be elicited from those of your readers who are retail chemists, and deal in that article.

As far as my information extends, the Leech trade is in the hands of very few: hence the price has been advancing gradually till it has reached a sum sufficiently high for both dealers and the public to make enquiry as to the cause thereof; and as there seems to be a probability of the increase of price still continuing, I presume I am justified in designating the system acted upon by the importers and merchants—a monopoly. There is only one other inference which I can draw, which is, that the supply is not equal to the demand.

Both the speckled (the genuine) and the green Leeches are in general use; and formerly a considerable difference of price existed between them. Now, however, they are nearly of the same value; and if, either by endeavouring to breed them here, (for which Naturalists should offer some encouragement,) or by the enterprise of men of business, the present system of permanent high prices could be broken up, it would, I am of opinion, benefit both the speculators and the public generally.

I am, Sir,
Yours, &c. &c.
May 15, 1840. Enquirer.

ON PITCH IN THE TREATMENT OF HÆMORRHOÏDS.

BY DR. WARDLEWORTH.

Hæmorrhoïds are of such frequent occurrence, and so often resist all modes of treatment, that we cannot multiply too much the number of means of which the utility has been demonstrated in a sufficient number of successful cases. The following, therefore, appears to us not uninteresting:—

Black pitch appears to produce advantageous effects against hæmorrhoïds. I became acquainted with this property in the following manner:—

A young woman, whom I had put to bed, was seized, six months after her confinement, with hæmorrhoidal pains, against which the ordinary means of treatment were entirely powerless. Fatigued by many attempts, she decided on following the advice of a neighbour, who assured her that some pills of pitch would relieve her; she took two of them, and almost immediately the tenesmus which she experienced and the pain in the stomach disappeared. Some time after, meeting her and finding her much better, she related to me what had occurred, and extolled the benefits she had derived from the pitch. I could mention a great number of cases in which I have found the same means successful; but, being unable to explain its mode of action, I will content myself with saying that it is very efficacious in internal and external hæmorrhoids with or without loss of blood. The following is the formula which I ordinarily make use of:—

Black pitch....3ij grains for three pills.

Two to be taken every night, and the abdomen to be kept free. The known efficacy of balsamics in the treatment of

hæmorrhoïds might, to a certain extent, account for that of pitch we have just mentioned.

SULPHUR IN RHEUMATISM.*

According to M. Rucker, sulphur is as powerful a specific for rheumatism, as mercury for syphilis. The first experiment he tried was on himself. From the age of fourteen years, he had frequently suffered from rheumatism, and believed that he had exhausted every remedy, when it occurred to him to have recourse to sulphur: he rubbed it into his legs, and put on his stockings again, in order to make it stay on. In about five minutes, he experienced great alleviation of pain: he was able to sleep, and since that time has not suffered from that painful malady; although he has several times been exposed to circumstances calculated to renew the attacks.

M. R. immediately applied this remedy to several persons attacked with the same complaint, and always with similar success.

FORMULÆ FOR LOZENGES.

BY MR. BARTLETT, CHELSEA.

CHALK LOZENGES.

1 lb. powdered sugar; 2 oz. prepared chalk, mucilage q. s.

BATH PIPE.

4 lb. powdered sugar; 4 oz. Italian juice dissolved in as small a quantity of water as possible; 2 oz. powdered gum Arabic to be mixed in very stiff, and rolled out in the usual form.

LAVENDER LOZENGES.

3 lb. powdered sugar; 1 drachm oil of lavender (English); 20 grains of drop lake rubbed up in a mortar with a little mucilage, then add a sufficient quantity of mucilage to form the mass; roll out and cut round.

BEST PEPPERMINT LOZENGES (A).

12 lb. *finest* powdered sugar; 2 scruples of smalts; 1 oz. English oil of peppermint; mucilage q. s.

If for transparent lozenges, the sugar need not be powdered quite so fine; but they must be rolled thinner.

(B.)

Use a sugar not quite so fine, and put only ½oz. of oil.

(C.)

10½ lb. of sugar; 2 scruples of smalts; 1 lb. 8oz. of gypsum ustum (P. P. P.); ½oz. oil of peppermint; mucilage q. s.

(D.)

9 lb. sugar; 3 lb. P. P. P.; 2 scruples smalts; ½oz. oil of peppermint; mucilage q. s.

MAGNESIA.

8 lb. powdered sugar, best; ½ drachm smalts; ½ lb. heavy magnesia; ½ lb. Howard's precipitated chalk; 20 drops of oil of nutmeg; mucilage q. s.

KICELAND'S DRYING PLAISTER.

Into an earthen vessel are poured four ounces of distilled vinegar, and four ounces of subcarbonate of lime; when the effervescence has ceased, four ounces of olive oil are added, and eight ounces of simple diachylon plaister; the whole is melted with a slow heat, constantly stirring with a wooden spatula. When the liquefaction is complete the vessel is taken off the fire, and when the whole begins to cool, pour in gradually 14 ounces of subacetate of lead; continue to stir until the mass has become quite cold.

ON THE PRESENCE OF PROTOXIDE OF LEAD IN THE BLOOD OF A HORSE, TO WHICH HAD BEEN ADMINISTERED, IN SEVERAL DRAUGHTS, A CONCENTRATED SOLUTION OF ACETATE OF LEAD.†

BY M. LASSAIGNE.

The experiments which have lately been made at the school of Alfort, on the administration of large doses of acetate of lead, have given an opportunity for ascertaining whether the blood of a horse submitted to the action of this salt, contains a certain quantity of it.

By my directions, M. Ausset, manager of the chemical works of the school of Alfort, undertook a series of experiments by which he has been enabled to prove that the carbon arising from the calcination of the blood of a horse, to which had been administered, at several doses, 780 grammes of acetate of lead, both in solution and in an electuary, contained, at the expiration of ten days, a small quantity of lead.

In treating, by heat, the carbon by weak nitric acid, he recognized, with the aid of re-agents, the unequivocal presence of this metal.

* *Journal de Chimie Médicale*, May, 1840.

† *Journal de Chimie Médicale*, April, 1840.

If, as we think, lead does not make part of the elements of the blood of the horse in the normal state, it must be concluded that the salts of protoxide of lead, like some other metallic compounds which have already been examined, may be absorbed and carried into the circulation.

New experiments, on the same subject, are about to be tried; and when they are concluded, we will hasten to publish the results.

ON THE PRESENCE OF PROTOXIDE OF LEAD IN THE ANIMAL ECONOMY.*

BY M. A. CHEVALLIER.

The paper presented by M. Lassaigne to the *Société de Chimie Médicale* notices new experiments to be made on this subject. Indeed, it would be of the greatest importance to discover the presence of oxide of lead in the tissues of subjects who have died through working in white lead manufactories. We have already made some experiments on this subject, but without success. However, M. Tanquerel Desplanches, who is occupied with the diseases caused by lead and its compounds, has shown that the skin of invalids submitted to hydro-sulphuretted baths, acquires a black tint, which would indicate the presence of a compound of lead in the tissues. These experiments are so much the more useful, as from our own investigations it appears that every year workmen attacked with lead colic die of that malady. If hospital statistics be consulted, it will be seen that 47 men working in lead compounds died during the years 1833, 1834, 1835, 1836, and 1839. These investigations might also be carried on with the view of discovering a new kind of treatment, more efficacious than those hitherto proposed.

EXPERIMENTS ON POISONING BY ARSENIC.†

BY M. ORFILA.

M. Orfila described to the Royal Academy of Medicine at its sitting of the 17th of March, two experiments which he has lately tried: 1st. A dog was poisoned with twelve grains of arsenious acid; he died at the expiration of twelve hours and a half: the urine did not contain an atom of poison; but the different organs contained a great deal. 2nd. Another dog was poisoned with two grains of the same substance placed in the cellular tissue of the thigh: he died in about thirty-six hours: the urine yielded some, and the viscera contained a prodigious quantity of it.

EXPERIMENTS ON THE ACTION OF TOBACCO ON ANIMALS POISONED BY ARSENIOUS ACID.‡

BY SIGNOR FLORIO.

Having ascertained by numerous experiments that a grain and a quarter of arsenic, or 24 grains of tobacco leaves were sufficient to kill a rabbit, Signor Florio administered to four rabbits of the same age, a grain and a quarter of arsenic each, and at the same time 3, 6, 12 and 24 grains of tobacco leaves. Now, he remarked that these animals, who had thus taken a double poison, died so much the quicker as the superadded quantity of tobacco was more considerable, so that he feels himself warranted in concluding that tobacco is not, as has been supposed, an antidote for arsenic; but that its action on the animal economy is similar. However, he would have obtained more accurate results if he had administered the tobacco at a later period, when the symptoms of poisoning first manifested themselves.

We may add that as one poison superadded to another, does not arrest its effects, but, indeed, hastens death, it cannot be definitively concluded that its action is the same. This remark applies not only to the case in point, but to others which may occur very frequently in legal medicine.

HYDRATED PEROXIDE OF IRON AN ANTIDOTE FOR SCHEELE'S GREEN.§

BY DR. SPAETH.

The following observation of a case wherein hydrated peroxide of iron has been successfully employed as an antidote for arsenite of copper is very important:—

A. B., aged three years, son of a landscape painter, licked a shell containing Scheele's green. In about half an hour, the child, generally thriving, had a pale and discomposed countenance; his mouth was smeared with a green colour; his tongue also was green. He had violent vomitings, diarrhœa, and excruciating pains in the lower part of the stomach. He uttered loud cries, held his abdomen squeezed with both hands, and ran about the room crying continually. He also complained of exces-

* *Journal de Chimie Médicale*, April, 1840.

† *L'Esperience.*

‡ *Observatore Medico.*

§ *L'Esculape.*

sive thirst. He was made to drink cold water, and a dose of fifteen grammes of hydrated peroxide of iron was prescribed, which he took at four times, in warm water. Scarcely had an hour passed after the exhibition of the antidote before the vomiting and diarrhœa ceased, as did also the pains and thirst.

Next morning all the symptoms of poisoning had disappeared, and, in a few days, the little patient was quite re-established.

FORMULA FOR HYDRATED PEROXIDE OF IRON, AS AN ANTIDOTE FOR ARSENIC.

BY MR. NEWBERRY, PRACTICAL CHEMIST, FETTER LANE.

℞ Purified sulphate of iron ..1000 parts.
Sulphuric acid (sp. gr. 1·847) 200 do.
Water .....4000 do.
Nitric acid, q. s.

Dissolve the sulphate of iron in the water, and add the sulphuric acid: heat the mixture to ebullition, and add nitric acid in small quantities, until all disengagement of gas has ceased, and red fumes are no longer produced by the addition of acid; which indicates that all the iron has passed to the state of peroxide. Suffer it to cool, and add to the solution 20 or 30 times its weight of water; precipitate the iron by the addition of ammonia in excess; wash the red gelatinous precipitate in a large quantity of water, by decantation, until the washings are no longer rendered turbid by baryta water; place the product on a cloth, and allow it to dry at the ordinary temperature.

When employed as an antidote for arsenious acid, it should be administered in a gelatinous state, and should be kept so in the shops. It is so much the more certain in operation, as its preparation is recent.

ON RE-VACCINATIONS UNDERTAKEN IN VILLINGEN IN 1838.*

From 123 re-vaccinations which were performed, it appears that from the age of 11 to 20 years, the individuals vaccinated are susceptible of receiving the vaccine virus with a more or less complete success in the proportion of two-fifths. This susceptibility increases again between the ages of 21 and 30 years. Variolous epidemics show that, in general, vaccinated individuals, when they are seized with this malady before the age of 20 years experience it in only a slight degree, but as they advance in age, variola is more serious, and that aged subjects, although vaccinated, become quite as ill as those who have not been. It is to be remarked that in the epidemic which existed in Villingen in 1837-8, no re-vaccinated individuals were known to take variola or varioloid, although many subjects were vaccinated in the houses where variola was. This little operation is never attended by any inconvenience.

* *Medicinische Annalen.*

TO CORRESPONDENTS.

NOTA BENE.—*All Communications must be addressed, "To the Editor of The Chemist, care of Mr. Hastings, Publisher, 13, Carey-street, Lincoln's Inn Fields, London." Communications must be sent before the 15th of each month.*

We are greatly indebted to MR. COATHUPE for his valuable communication.

We thank MR. BARTLETT and MR. NEWBERRY for their communications.

A SUBSCRIBER.—Slaked lime, mixed in small quantities with the soil, which should afterwards be dried by exposure to the sun, or a gentle heat, will entirely remove all noxious effluvia.

A CHEMIST is informed that a perfect decomposition of the sulphates of baryta, lime, strontian, &c., cannot be effected by the means of which he speaks: sulphurets only of those earths are the result of such operations.

MR. SMITH.—Copaiba balsam may be mixed with distilled or soft water by means of mucilage or yolk of egg.

MR. WILSON will find the method of making sweet nitre in The Chemist, No. III.—and that of preparing mint lozenges, in our present No.

W. M. L.—The method of separating the stearine from the elaine, in tallow, cocoa-nut oil, and palm oil, is as follows:—The tallow, or oil, is first melted and then left to cool to the point at which it assumes the granulated form: it is then put into strong canvas or horse-hair bags, and being placed upon the plate of a hydraulic press, a gentle pressure is at first made upon the bags: it is increased and continued until all the elaine has run out, which is known by its ceasing to flow, on additional pressure being made.

A CONSTANT SUBSCRIBER, Leeds.—The omission was made for reasons given in No. III.

MR. THOMAS, Shaftesbury.—We considered, medically speaking, that the salts in question are not inert.

STEWART AND MURRAY, PRINTERS, OLD BAILEY.

THE CHEMIST.

I. CHEMISTRY.

ON THE NATURE OF THE ODOUR MANIFESTED IN CERTAIN CHEMICAL ACTIONS.

LETTER FROM M. SCHOENBEIN TO M. ARAGO.

The very interesting ideas which you published in the *Annuaire* for 1838, encourage me to acquaint you with the results of investigations which I have lately undertaken with the view of throwing some light on the nature of the odour called *electric*.

Some years ago I was struck with the perfect analogy existing between the odour which is developed when ordinary electricity passes from the points of a conductor to the surrounding air, and that which is disengaged when water is decomposed by a Voltaic current.

After having made many useless experiments in order to discover the connection existing between the two above mentioned phenomena, I arrived, not, indeed, at a complete solution of the problem, but at a point which may give an idea of the true cause of the electric odour. The facts which relate to the subject in question, are as follow:—

1. The smell of phosphorus, developed during the electrolization of water, is disengaged only at the positive electrode.

2. The disengagement of the odorous principle depends:—1st, on the chemical nature of the substance which serves for the positive electrode: 2nd, on the chemical constitution of the electrolytic fluid placed between the electrodes: 3rd, on the temperature of that fluid. As to the first condition, I have found that, of all the metals examined, gold and platinum alone permitted the disengagement of the peculiar odour. The more easily oxidizable metallic substances do not give the least trace of it. It is the same with carbon. With respect to the connection existing between the chemical constitution of electrolytic fluids and their faculty of disengaging the odoriferous principle, my experiments have shown as follows. The electric odour is developed at the positive electrode, when the fluid consists of distilled water mixed with sulphuric, phosphoric, or nitric acid, or potassa, or a variety of oxy-salts. The odour is not perceived when the water contains chlorides, bromides, iodides, fluorides, proto-sulphate of iron, or any substance having a great affinity for oxygen. Nor does the disengagement of the odoriferous principle take place if the first mentioned fluids are mixed with small quantities of proto-sulphate of iron, or nitrous acid, or with any substance the affinity of which for oxygen is very great. The fluids which develope the electric odour abundantly at a low temperature do not disengage any when heated to their boiling point. It sometimes happens that the odour is not manifested at all, although the circumstances under which the electrolization of the water is effected are such as might lead us to expect a contrary result. This most frequently occurs when the fluid employed is an aqueous solution of potassa. There are some reasons to believe that the disengagement of the odoriferous principle is impeded by impurities deposited on the surface of the positive electrode. According to my experiments, this principle may be obtained most abundantly by employing water as an electrolytic fluid, mixed with a sixth part of sulphuric acid.

3. The odoriferous substance disengaged at the positive electrode may be confined and kept in well-corked flasks.

4. When a small quantity of charcoal, or filings of iron, zinc, tin, lead, bismuth, arsenic or antimony, or a few drops of mercury, or nitric acid, or of a solution of proto-sulphate of iron, or protochloride of tin or iron, is put into a flask which contains the odoriferous principle (mixed with oxygen), the electric odour is almost instantaneously destroyed. Gold and platinum produce the same effect at a high temperature.

* *Compte Rendu de l'Academie des Sciences*, No. 18.

5. When we immerse, for some moments, in a flask which contains the odoriferous principle (mixed with oxygen), a plate of gold or platinum whose surface is very dry, well scoured and cold, this plate becomes electro-negative; that is to say, it acquires the faculty of producing a current to which it serves as a negative electrode. In other terms, a plate of platinum treated in the above-mentioned manner, constitutes, with a similar piece of the same metal in its ordinary state, a voltaic element. This element is such, that the current which it produces goes from the platinum through the liquid to the plate modified by the odoriferous principle. I call the extraordinary state of this plate, *negative polarity*. Easily oxidizable metals are not polarized negatively under the circumstances which I have just mentioned. Five years ago I demonstrated that the precious metals acquire negative polarity, when plunged for a short time into an atmosphere of chlorine or bromine.

6. The state of negative polarity is not developed either in gold, or in platinum, or in any metal whatever, when these bodies are immersed in a flask in which the electric odour has been destroyed by the above-mentioned means.

7. The negative polarity of platinum is destroyed, when it is suspended for a few moments in an atmosphere of hydrogen. Platinum, negatively polarised by the influence of chlorine or bromine, resumes its ordinary state when it is put into hydrogen. The same result may also be obtained by heating polarised metals to redness.

PHENOMENA OF POLARISATION AND ODOUR CAUSED BY ORDINARY ELECTRICITY.

8. When a plate of platinum or gold, the surface of which is very dry, well scoured, and cold, and which communicates with the earth, is exposed for some moments to the action of ordinary electricity arising from a metallic point attached to the first conductor, and when this exposure is effected in such a manner, that the surface of the plate receives, at a convenient distance, the electric "aigrette," the gold or platinum assumes negative polarity. This peculiar condition is destroyed, when these metals are submitted to the action of hydrogen or heat.

9. Gold or platinum, being attached to the first conductor, that is to say, acting as points of emission, do not acquire negative polarity, although electricity passes off very powerfully.

10. Easily oxidizable metals cannot be polarized by ordinary electricity.

11. The electric "aigrettes" lose their polarizing power as well as their phosphorous smell, when the points from which they proceed are wrapped in a piece of linen impregnated with distilled water, or saline, or acid solutions. The same effect may be obtained by strongly heating the points of emission of the first conductor.

There are other facts relative to the phenomena of voltaic polarization, but I shall not speak of them now, because a memoir, in which I have given all the observations I have made on this subject, will very soon appear in the *Bibliotheque Universelle*.

Before finishing my letter, permit me to draw some conclusions from the facts which I have just related.

1. The phosphorous odour disengaged during the electrolization of the water, is owing to the same gaseous substance which is developed near the metallic points from which the ordinary electricity, whether positive or negative, proceeds.

2. As to its voltaic action, this odoriferous principle is absolutely similar to chlorine and bromine. With respect to chemical properties, there exists a great analogy between the odoriferous substance and the bodies which I have just mentioned.

3. The odoriferous principle is chemically combined with hydrogen, and in this state of combination, it is diffused, either in water, or in the atmosphere.

4. This compound is an electrolytic body.

5. The electric odour is manifested when this body is electrolyzed and its electro-negative element set free.

6. As the electric "aigrettes," like lightning, constitute a true current, and as the compound of which I have just spoken is spread in the air, the odoriferous principle must be disengaged every time that sparks and lightning traverse the atmosphere, that is to say, a peculiar odour must be developed. I have observed that the odour of this principle is pungent when the latter is concentrated, and that it much resembles that of phosphorus, when the substance is much diluted with air. This circumstance perfectly explains the differences of opinion concerning the smell produced by lightning.

Being almost sure that the odoriferous principle should be ranked in the class of bodies to which chlorine and bromine belong, that is, among elementary and hologeneous substances, I propose to give it the name of *ozone*. As I am convinced that this body is always disengaged in the air, and in perceptible quantity, in stormy weather, I intend to make a series of experiments in the course of this year for the purpose of showing the presence of ozone in the atmosphere. With this view, I shall place plates of platinum in very elevated places, taking care to make them communicate with the earth. This metal acquiring negative polarity by the action of the odoriferous principle, it may be concluded that ozone is developed, whence the platinum is found to be negatively polarized. I consider this kind of

meteorological experiments sufficiently interesting to be undertaken every where, and I dare engage you to make similar observations at the Observatory, with the view of proving the negative polarity assumed by platinum under the influence of ozone. I make use of a galvanometer, the wire of which forms 2000 turns, and whose magnetic needle is astatic.

I cannot conclude my observations without saying that I am indebted, for many of the results of which I have spoken, to Mr. Grove's truly admirable pile, namely, a pile of very small dimensions, and which, however, gave me 15 cubic inches of detonating gas per minute.

ON THE COMPOSITION OF CRYSTALLIZED PHOSPHORIC ACID.*

BY M. PELIGOT.

The interest which has attached to facts concerning phosphoric acid and the phosphates, since Mr. Graham's investigations, has induced me to undertake researches, with the view of completing our knowledge concerning the combinations of water with phosphoric acid.

The facility with which Mr. Graham has explained the alterations in their properties which this acid and its salts undergo by calcination, is well known: this chemist has proved that phosphoric acid forms salts in which water supplies the place of a true base, susceptible of being replaced by a mineral base in equivalent quantity, by double decomposition; and, in considering that this acid, separated from those classes of salts which were formerly called phosphates, metaphosphates and pyro-phosphates, still retained, at least for some time, the original properties which it possesses in its combinations with bases, Mr. Graham has admitted that phosphoric acid may combine with water in three different proportions, forming a phosphate of water ($Ph O^5$, HO), a biphosphate ($Ph O^5$, 2 HO) and a triphosphate ($Ph O^5$, 3 H O).

But the existence of these compounds has hitherto been considered hypothetical, with the exception of the first, which appears to be vitreous phosphoric acid. We know how difficult it is to obtain phosphoric acid in the crystallized state: for this reason, its analysis, in this state, has never been attempted, or, at least, it has never been published.

I have endeavoured to fill up the gap which the history of phosphoric acid thus presents, by analysing crystals formed spontaneously in flasks containing phosphoric acid in the syrupy state.

One of these flasks exhibited two perfectly distinct crystalline layers: one occupied the lower part of the vessel and was separated by a very thick layer of syrupy phosphoric acid: these two crystallizations seemed to be of different formation and age; the upper crystals were transparent and hard; the lower ones were soft, and had the appearance of sugar of honey. These crystals, separately detached, were dried *in vacuo*, by placing them on porcelain plates; the dosing with water was effected by calcining them with oxide of lead.

According to my analysis, the upper crystals contained from 27 to 28 per cent. of water; and the crystals which adhered to the bottom of the flask, from 22 to 23.

The excessive avidity of these crystals for water renders a very accurate analysis very difficult, if not impossible; however, according to theory, hydrated phosphoric acid with three equivalents should contain 27·4 of water; and that with two equivalents, 20·1 per cent.

It is probable, therefore, that the upper crystals are formed by the hydrate with three equivalents, and the lower ones by that with two equivalents: besides, the properties of the products which I have analyzed justify this conclusion; for acid which lost 27 per cent. of water, saturated with ammonia, caused a yellow precipitate in nitrate of silver: the other acid forms a white precipitate with the same reagents. It is well known that these characters belong, or ought to do so, to the two hydrates under consideration.

In conclusion, the analyses detailed in my Memoir realise Mr. Graham's expectations concerning the existence of three hydrates formed by phosphoric acid; though the results which I have obtained are not so clear as could be wished, I have thought it my duty to publish them.

OBSERVATIONS CONCERNING ATMOSPHERIC ELECTRICITY.†

BY M. PELTIER.

The instruments used for measuring electricity indicate only the electrical differences of the bodies put in contact, and not the absolute quantity contained in one of them. This defect is a serious inconvenience in meteorological observations, since the instrument may be subjected to a powerfully electric atmosphere without giving any indication. To this defect, which is common to two kinds of electrometer, the multiplier joins great inferiority in sensibility, as I

* *Compte Rendu de L'Académie des Sciences*, No. 18.

† *Compte Rendu de l' Academie des Sciences*, No 18.

have shown in a memoir published in the *Annales de Chimie et de Physique*, vol. lxvii. I proved that the best multiplier required 7069 degrees of static electricity to cause a dynamic deviation of one degree. These two defects of the multiplier, have rendered this apparatus insufficient for studying atmospheric electricity in clear weather, taking for extreme points, the ground on one part and the atmosphere, at the height of a house, for the other. The multiplier likewise serves only for the indication of the electricity of stormy clouds.

I desired to resume this question and to examine the atmosphere at greater heights: experiments were made in an elevated plain three leagues from Corbeil, in M. Bregnet's grounds, where I found all the assistance I could desire, in instruments, knowledge, and devotion to science. Professor Guttierez took an active part in our investigations.

On the 21st of April, the sky was very clear; however, vapours forming long *cirri* connected distant *strati*, and advanced slowly into space. The air gave weak electric signs at three metres from the ground; the lower wind was north-west, while at the height of the clouds it was southerly. Towards noon, we sent up a kite attached to a copper wire 400 metres long: the wheel around which the wire was rolled had a counter; all the apparatus might be isolated if required. A multiplier of 3000 turns communicated with the wire by one of its extremities, and with the ground by the other: an electroscope could control the indications of the multiplier.

The kite arrived at a height of 30 metres, whilst the multiplier had not given any sign of a current, and whilst the electroscope had indicated a positive and increasing tension. From 30 to 50 metres, the multiplier deviated from 2 to 3 degrees, and indicated a positive descending current. Above this height, the multiplier and electroscope indicated a neutral zone; we then had a negative descending current of 2 or 3 degrees. The electroscope gave at this negative zone a thickness of about 20 metres, above which we again found the atmosphere positive. The new positive current was feeble at first; but when the kite rose to 120 metres, the needle began to proceed rapidly; when it arrived at 180 metres, the current gave 60 degrees, corresponding to 160 proportional degrees.

This subversion was too curious a fact not to attract our attention: we examined the atmosphere again next day and some days following: in the days following, this first experiment had an uniform serenity, which did not present any subversion of sign: the atmosphere was positive from 2 metres above the ground; the tension increased until 30 or 40 metres, at which height the quantity of electricity becomes sufficient to act on the needle of the multiplier. From 40 to 100 metres of elevation, the needle rose feebly, but from that height it proceeded rapidly; and the kite having once risen to 247 metres, the needle struck the stay at 90 degrees, and was maintained at between 70 and 80, which gave a current of at least 600 proportional degrees.

The uniform fact, which we found during those fine and dry days, was that electricity increased slowly until 100 metres; but that above that it increased rapidly until the greatest height we could attain. The needle was not tranquil in its deviation: it varied much, according to the changes and power of the wind. It was principally when the head of the kite was agitated, that the variations of the needle were most extensive: at this time it often described an arch of from 10 to 25 degrees, corresponding to from 30 to 80 proportional degrees.

ON LIQUID STORAX.*

BY E. SIMON.

In the *Journal de Pharmacie* for June 1831, M. Bonastre published the results of his investigations concerning a liquid storax procured from America; although the description he gives of the exterior aspect of this substance does not completely coincide with that of the storax of commerce, M. Simon thinks he may conclude from the similarity of the results obtained by M. Bonastre and himself, that this storax differs from that of commerce only by its recent state and greater purity. M. Simon has resumed M. Bonastre's work, and has enriched the history of some of the immediate principles of liquid storax with many new facts.

It was long thought that its acid was benzoic acid; but when the excellent works of MM. Plantamour and Frémy had discovered the existence of cinnamic acid in the balsams of Peru and Tolu, M. Liebig raised some doubts on this subject, and presumed, on account of the resemblance of storax to those balsams, that its acid also was cinnamic acid. This conjecture is verified by M. Simon's experiments. By distilling the acid procured from storax with nitric acid, he obtained essential oil of bitter almonds. The composition of the salts of silver studied by M. Marchand, who has undertaken the analytical part of M. Simon's work, tends still farther to confirm the correctness of this opinion.

The essential oil, obtained by distilling liquid storax with water and carbonate of soda, which does not seem to make it

* *Annalen der Pharmacie*, vol. xxxi.

undergo any alteration, is limpid: it presents the very agreeable smell which is peculiar to storax, and bears some resemblance to that of pure napthaline: it is soluble in alcohol and in ether, and refracts the luminous rays like creosote.

After some months it becomes thickened into a transparent, gelatinous mass, as viscous as a solution of caoutchouc. In this state it has lost its solubility in ether and alcohol, and essence of turpentine dissolves but a few traces of it. After the volatilization of the solvent, an uncrystallizable gelatinous mass remains.

If essential oil of storax be distilled in a bath of chloride of zinc, a portion of it passes to the state of a very fluid oil, the quantity of which is greater as the essential oil is more recent; the inverse occurs with the residue in the retort.

The volatile part, for which M. Simon proposes the name of *styrole*, is formed, according to several analyses, of equal atoms of carbon and hydrogen, or of

Carbon	92·46
Hydrogen	7·54
	100·00

consequently, it is isomeric with benzine.

The name best adapted for the solid residue, would be that of oxide of styrole.

If the essential oil of storax be distilled with nitric acid, it becomes brown and resinous: when this alteration is complete, the excess of acid is decanted off, and the resin is purified by washing: afterwards, when submitted to distillation with water, there passes over with the resinous vapours, a volatile oil, which has an extremely distinct smell of cinnamon, but, indeed, much stronger. When applied to the skin, it occasions a smarting like the essential oil of mustard, and reddens it, causing as much pain as the latter. If the recipient be kept cold, this oil crystallizes in a very short time, and may be separated by filtration from the water, which dissolves only a few traces of it; if the crystals be then dried, and dissolved in alcohol, which preserves in them their acerbity, the crystals yielded by this solution are of much greater beauty. They have the aspect of rhomboidal prisms, under the form of five tables. Without having yet studied them, M. Simon thinks that the name of *nitro-styrole* should be given them. Their taste is very similar to that of nitro-benzine. Styrole is the only substance of the essential oil of storax which produces this matter: oxide of styrole does not in any way contribute to its formation. The other products of this decomposition are benzoic and hydrocyanic acids.

When the essential oil has been extracted from storax by distillation, there is found in the retort an alkaline solution of cinnamate of soda, and a great quantity of resinous matter. It is filtered; the cinnamic acid is precipitated by means of dilute sulphuric acid; it is dissolved in alcohol, and the solution is evaporated in the air, in order to obtain crystals. These crystals are large, white, brilliant, rhomboidal prisms of 79°, in the form of tables. The property possessed by this acid, of yielding oil of bitter almonds by distillation, has already been mentioned. Hydrocyanic acid may likewise be obtained by rectifying the product of the distillation over sea-salt. The other products of the distillation are benzoic acid, picro-nitric acid, and resin, which form the residue in the retort. If cinnamic acid be distilled with bichromate of potassa, and dilute sulphuric acid, pure hydroguret of benzöile is produced; distilled with three times its weight of slaked lime, it yields a light volatile oil, colorless after rectification, which resembles benzine in its preparation, and many of its properties; such, for instance, as its insolubility in water; and which might assume the analogous name of *cinnamomine*: it has also the same composition as benzine; but it is, however, a different body.

With fuming nitric acid, *nitro-cinnamomide* is formed, resembling nitro-benzide in taste and smell.

Cinnamic acid is not decomposed, when distilled with a concentrated solution of caustic soda.

The resinous mass remaining in the retort, after the separation of the basic cinnamate of soda, contains styracine, which was first discovered by M. Bonastre. This substance may be isolated by dissolving the resinous mass in 18 or 20 parts of boiling alcohol of 0·825, filtering and withdrawing, by distillation in the sand-bath, two-thirds of the alcohol employed, and exposing the residue to a low temperature. The styracine, precipitated after cooling, may be purified by repeated washings with cold alcohol, and by being dissolved in 6–8 parts of ether. The ether is driven off by distillation in a sand-bath; and the styracine remaining is then chemically pure.

This substance is soluble in 3 parts of boiling alcohol, of 0·825; and in 20 to 22 of the same alcohol cold. Water, even when boiling, dissolves scarcely a trace of it. It fuses into an oleaginous liquid, which solidifies, without presenting a crystalline texture. It melts even at 40° Reaumur. Its best solvent is sulphuric ether, of which it requires scarcely 3 parts at the ordinary temperature; however, the alcoholic solution gives the finest crystals, because the evaporation is slower. It is neither acid, nor alkaline; it does not contain azote: and is especially distinguished from cinnamic acid, by its action with the alkalies, by its easy crystallization, &c.: for the rest, many of

the principal properties of these two substances, are common to both.

When distilled with nitric acid, styracine does not produce essential oil of bitter almonds: but the product of the distillation, when rectified, contains also hydrocyanic acid, as with cinnamic acid. There are also found in the residue of the retort, the same products as with the latter acid; namely, benzoic acid, picro-nitric acid, and resin. It gives also hydroguret of benzoile, by being distilled with bi-chromate of potassa and sulphuric acid. M. Simon observes, on this subject, that the styracine employed in these experiments, was perfectly free from cinnamic acid.

When distilled with hydrate of lime, it yields an essential oil, like cinnamic acid. The composition in hundredths of the latter, is also the same as that of benzine: but it appears essentially different from it, as also from cinnamomine.

If styracine be distilled with a strong solution of caustic soda, it acts in a totally different manner from cinnamic acid. Whilst the latter acid does not undergo any decomposition by the caustic alkalies, styracine gives rise to a heavy volatile oil, which passes over with the steam, and which differs from cinnamomine in its specific gravity, (it is much heavier than water,) in the oxygen which it contains, in its boiling point being much higher (it boils at 220° R.), and in its great solubility in water, (it dissolves in 30 parts of boiling, and in 90-100 of cold water,) its odour and taste do not in the least resemble those of cinnamomine: it has an exceedingly agreeable odour, similar to that of a mixture of essence of roses, bitter almonds, and cinnamon. M. Simon proposes the name of *styraçone* for this substance. Its elementary analysis is not yet completed. The residue in the retort, in this decomposition of styracine, is formed of basic cinnamate of soda, and resin. The cinnamic acid procured from it, is very pure. It crystallizes in rhomboidal prisms of 146°; and although its crystallization differs from that of cinnamic acid extracted from storax, M. Marchand has discovered in them an identity of crystallization.

From the preceding, it results that styracine is decomposed by the caustic alkalies into styraçone, cinnamic acid, and resin; and it is for this reason that we should not extract cinnamic acid from storax, by means of caustic alkalies, if we wish to procure styracine from it. A solution of carbonated alkalies must always be used, as they do not decompose styracine, even when in the greatest state of concentration, and at a boiling heat.

Styracine has no capacity of saturation; however, acids augment its solubility, as is observed with cinnamic, crystallized acetic, and sulphuric acids, &c.

The elementary analysis of styracine, gives:—

24 C=	84·47
22 H=	6·32
2 O=	9·21
	100·00

After the separation of the substances which we have just studied, there remains a hard and a soft resin, soluble partly in ether, and partly in alcohol, which do not present anything worthy of interest.

DECREPITATING SALT OF WIELICZKA.*

At the sitting of the Academy of Sciences of Berlin, on the 14th of October, 1839, M. Rose read a paper on this remarkable salt, which is distinguished from ordinary decrepitating sea-salt, by its decrepitating not only in the fire, but even when dissolved in water. As it dissolves in that liquid, there are disengaged with noise bubbles of a gas which is evidently compressed in the salt, and which is the cause of this decrepitation. M. Dumas analysed a very small quantity of this gas; it seemed to him to be formed of hydrogen and carbon. M. Rose, in examining this gas *de novo*, ascertained that its volume was about half that of the salt, that it had nearly the same composition as marsh gas; and that probably it was compressed in the salt, to the point at which it assumes the liquid, or even the solid form.

This decrepitating salt deserves peculiar attention; considering that many minerals decrepitate like it by heat without disengaging the slightest trace of humidity. It is probable that this phenomenon also is owing to the expansion of a gas, which is confined in the interior of these minerals, under a considerable pressure.

ON QUININE.†

BY M. H. MAGONTY.

An accidental circumstance led M. Magonty to study the influence of the ammoniacal salts on the manner in which quinine acts when treated at different degrees of temperature. Thinking, with him, that every thing relating to this alkaloid is highly interesting, we give the conclusions which he has himself drawn from his observations:—

1st. Quinine is more soluble in water

* *Journal de L'Institut.*

† *Journal de Chimie Medicale*, May 1840.

than has been supposed, and its solution is assisted by heat:

2nd. It is dishydrated in the midst of water at 60°:

3rd. Quinine may easily be crystallized with the assistance of water, whilst alcohol effects this result but very difficultly:

4th. Ammonia, without heat, decomposes the salts of quinine only very partially, as is the case with the salts of magnesia, and, the ammoniacal salts are decomposed by quinine by boiling in water.*

EXAMINATION OF THE BARKS OF THE TRUE AND FALSE ANGUSTURA.†

BY M. GENEST.

Not finding in the authors who have written on this subject, any very well defined distinctive characters between the two angustura barks, I have repeated the experiments given in books, and I have also undertaken a series of new ones, in the endeavour to establish some striking differences. Although I cannot flatter myself with having attained my object, still every thing relating to the distinction of these two barks from one another is so important, that I think it my duty to publish the results which differ from those indicated in books, and which I think I have discovered, as well as the new re-actions presented in the experiments which I have made with this intention.

A drachm of each bark, in powder, was macerated in an ounce and a half of distilled water: the supernatant liquor, when filtered, presented the following phenomena:—

	TRUE.	FALSE.
Chloride of Barium ..	No precipitate	Much turbidness; afterwards a precipitate, which was not wholly re-dissolved in nitric acid.
Bichloride of Mercury	A re-action, agreeing with that indicated in the books	An abundant dirty white precipitate.
Emetic	The same.....	Instead of a white precipitate, I obtained but slight turbidness.
Perchloride of Iron ..	A very abundant reddish-brown precipitate	Dirty green.
This re-agent seemed to me to present a greater difference than the sulphate of the same base.		
Sulphuric Acid	It did not much affect the true, as it is said it should do. I obtained only a very slight turbidness.	

DECOCTION.

I boiled a drachm of each angustura bark in an ounce and a half of distilled water for ten minutes, and I remarked that the powder of the true acquired a greater bulk than that of the false; and that its decoction was more difficult to filter.

The decoction of the true angustura retained its colour and transparency, when kept for several days; whilst the false stained the sides of the vessel, and assumed a blackish brown colour.

	TRUE.	FALSE.
Chloride of Barium	Nothing	Turbidness.
Nitrate of Silver	An abundant yellowish precipitate	Nothing.
Sulphuric Acid	Yellow precipitate	Nothing.
Perchloride of Iron ..	Greyish precipitate	Deep green, without precipitation.
Caustic Potassa.....	Reddish-yellow coloration by refraction; and dirty green by reflection	Greenish tint. The liquor remained transparent.
Phosphate of Soda	Nothing	Nothing immediately; afterwards a deep brown coloration.

* For an article on the action of ammonia on quinine, see *The Chemist*, No. IV. p. 111.

† *Journal de Chimie Médicale.*

ON THE PRESENCE OF COPPER IN VARIOUS NATURAL PRODUCTS, WITH PROCESSES FOR DETECTING IT.*

BY M. A. THIEULLEN.

The presence of native copper in various natural products, seems to be well demonstrated, and to be no longer doubtful; especially since the appearance of the recent works of MM. Devergie and Hervy, who have informed the Academy of Medicine that there exist, in the tissues of man and animals, small quantities of copper and lead.

This question has lately been again raised in Belgium, and two different opinions have been formed concerning it.

M. Rotermand is of opinion that it exists in all grains.

M. Koperynsch'y, who has just published a work on the adulteration of bread, thinks that this metal does not exist in bread; and he says that he has not found any trace of it in grain.

This subject is of the highest importance, especially when it is taken into consideration that small quantities of sulphate of copper have been introduced by some bakers into the dough, at the time of making it into bread, and that investigations are frequently made with the view of detecting the presence of copper arising from this salt.

This question is of still greater importance in Belgium, where the employment of sulphate of copper is at the present time the subject of legal investigations. Although this salt is no longer employed in France, thanks to the measures taken by Government, it is no less true that it would be useful to decide so serious a question, and that investigations should be undertaken by order of the authorities, by men whose names would be a guarantee, and give the force of law to the results of their experiments. This measure is so much the more urgent, as M. Rotermand is not the first who has detected the presence of native copper in organic products, as I shall show, by summing up in few words the experiments made on this subject, which I shall arrange in the order of their dates.

In 1828, M. Boudet informed the *Société de Pharmacie de Paris*, at its sitting of the 15th of March, that M. Vauquelin had announced to the Institute that M. Sarzeau had detected the presence of copper in a great number of vegetables.

M. Vauquelin had already found this metal in blood: but, as he had used a copper vessel, he attributed to this the copper which he detected in the ashes.

In 1830, M. Sarzeau published, in the *Journal de Pharmacie*, a work on the presence of copper in vegetables and blood.

In this work the author, being desirous of giving every one his due, sets forth, according to Berzélius, in his *Traité de Chalumeau*, published in 1821, page 7:—1st, that Gahn, long before it had been suspected that the ashes of vegetables contained copper, had several times extracted this metal from the ashes of different kinds of paper:—2nd, that Vauquelin, in analysing a plant, had found copper in it, in a more conclusive manner:—3rd, that the discovery of copper in vegetables, belongs to Meissner, who detected it in a great number of exotic and indigenous plants. The following is the process which he adopted, and which is published in Schweigger, Vol. xvii. pp. 340 and 436. The plant is incinerated, and the ashes are washed with distilled water, to remove the soluble salts: the residue is boiled with hydro-chloric acid, the solution is saturated with ammonia, so as to leave only a slight excess of acid; it is filtered, and a plate of iron or zinc is steeped in the liquid, and assumes a cupreous appearance, at the expiration of a day or two.

According to these different experiments, M. Serzeau thus shows the quantities of copper which he has obtained from the undermentioned substances:—

		[copper.
500 gr.	of grey quinquina yielded	2 milligr.
,, ,,	of Madder	2 ,,
,, ,,	of green Martinico coffee	4 ,,
,, ,,	of yellow Bourbon coffee	4 ,,
256 ,,	of Coffee grounds	3 ,,
1½ kilog.	of Wheat incinerated	7 ,,
1½ ,,	of fine Flour	1 ,,
1 ,,	of Blood taken cold	1 ,,

M. Sarzeau also said that he found copper in bran, tea, rice, saraxin, rye, barley, corn, and in the bark of malambo. But, as he operated on too small quantities, he could not determine in what proportions.

This chemist concluded, from his experiments, that the annual consumption of flour in France represented 7,300,000,000 kilogrammes of wheat, containing 361,000,000 kilogrammes of copper.

M. Sarzeau also says that bran contains a greater quantity of copper than wheat and flour; but he was unable to ascertain the weight, on account of an accident which occurred during the operation.

M. S. has substituted another process for that of Meissner. It consists, 1st, in washing the ashes in water, in order to remove the soluble salts: 2nd, in treating with hydrochloric acid, in saturating the solution by an excess of ammonia, and in filtering the liquor: 3rd, in precipitating the copper by prussiate of potassa: 4th, in decomposing the prussiate thus obtained, by the action of

* *Journal de Chimie Médicale*, May 1840.

heat, and in treating the residue by weak sulphuric acid, in order to convert it into a sulphate: 5th, in decomposing this sulphate by a sheet of iron. He says that it is necessary to operate on one pound at least.

After giving the means by which he obtained these results, M. Sarzeau says positively:—

"Chemists, called upon to give an opinion in cases of poisoning, will thus find it necessary to be on their guard, when, in examining very large quantities of animal matter, they find only traces of copper: I say traces; for I do not think that there exists more than a milligramme of copper in a kilogramme of blood taken cold."

In 1832, Piétro Perréti, professor of Chemistry and Pharmacy at Rome, published a work on the presence of copper in wine.* He gave means of detecting this metal, and distinguishing when it exists in it naturally, and when it has been introduced into it.

In 1833, M. Boutigny published a work entitled: *On the presence of copper in corn and many other substances.* He sums up the results of his experiments as follows:—

1st, Food or broth prepared in copper vessels, almost always contains copper, more or less, which is a great objection to the uses of that metal for culinary purposes:

2nd, Wine, cider, and corn sometimes contain copper, but only when the ground in which the vines, apple-trees, and corn grow, contains it; which allows us to affirm that the presence of copper in vegetables, does not result from the act of vegetation, but from absorption.

3rd, The detection of copper in food and drinks, raises a medico-legal question, which causes a necessity for fresh investigations; and this should render juries very circumspect in cases of poisoning by copper.

In 1837, M. Bouchardat announced the presence of copper in muscles, and concludes by the following passage †:—

"From these facts, it results that muscles may naturally contain a sufficient quantity of copper to produce poisoning.

"M. Bouchardat refers the presence of this copper to the muscles having been collected from the sheathing of ships. He says he obtained this metal by the process recommended by M. Sarzeau.

M. Bouchardat's opinion, which refers the poisonous action of muscles to the copper which they contain, has been contested by M. Orfila.‡ The following is what he says on this subject:—

"As to cupreous preparations, how can their introduction into the bodies of these molluscæ be conceived? Doubtless, after their solution in water. Now, the analyses of sea-water, made in various places, have never demonstrated the existence of an atom of copper: besides, would not these animals be killed by swallowing a cupreous preparation?"

From what we have above explained, it would seem that the existence of copper in the native state in various substances is well demonstrated: we also think that the recent publications of M. Orfila may permit greater rapidity of operation, by treating flour or bread with pure nitric acid, obtaining a *nitric carbon*, treating it with distilled water, filtering, passing a current of hydrosulphuric acid through the filtered liquor, collecting the precipitate, converting it into a sulphate and using the sheet of iron. The carbon may be incinerated in order to ascertain whether any copper remains in it, which is not probable.

* M. Sarzeau says that copper, or sulphate of copper which had been added to bread, may be detected by the blow-pipe, which is not the case with the copper which forms a constituent part of corn or flour.

† Vide *Annales d'Hygiéne*, Vol. xvii. p. 358.

‡ In his *Toxicologie*, vol. ii. p. 42.

ON NEW COMBINATIONS OF CHLORIDES, BROMIDES, AND SULPHURETS OF NAPTHALINE.

BY M. A. LAURENT.

In this memoir M. Laurent describes:—

1st. Hydrochlorate of chloro-napthalise, which crystallizes in fine prisms with a rectangular base. By distillation and by potassa it loses hydrochloric acid, and pure chloronapthalise is obtained.

Its formula is $C^{40}\ H^{10}\ Cl^6 + H^4\ Cl^4$.

It is prepared with chlorine and hydrochlorate of chloro-napthalise.

2nd. An oily hydro-chlorate, isomeric with the preceding, and a sub-hydro-chlorate, equally oily, whose formula is $C^{40}\ H^{10}\ Cl^6 + H^2\ Cl^2$.

3rd. Crystallized hydro-bromate of bromo-napthalose, decomposable by distillation and potassa, which deprive it of hydro-bromic acid.

Its formula is $C^{40}\ H^8\ Br^8 + H^4\ Br^4$.

It is formed by exposing bromine and bromo-napthalose to the sun.

4th. Broma-napthalose, which crystallizes in needles. It is not alterable by potassa and distillation.

Its formula is $C^{40}\ H^8\ Br^8$.

It is prepared by distilling No. 3.

5th. Sub-hydro-bromate of bromo-napthalose, crystallized in needles. Potassa and distillation decompose it.

Its formula is $C^{40}\ H^8\ Br^8 + H^2\ Br^2$.

It is prepared in the same manner as No. 3, and is found mixed with it.

6th. Crystallized chloro-bromo-napthalise, not decomposable by potassa and distillation.

Its formula is C^{40} H^{10} Cl^4 Br^2.

It is prepared by para-chlora-naphthalese and bromine. Its formation proves that chloro-napthalese and the para-chloride are really two different bodies.

7th. Crystallized chloro-bromo-napthaléise.

Its formula is C^{40} H^{10} Cl^4 Br.

It is not decomposable by potassa and distillation.

8th. The most important part of this Memoir is that which concerns the action that potassa and distillation exercise on a compound which I have called hydro-bromate of chloro-bromo-napthalose. It proves that I was completely wrong in saying, formerly, that, *Experiments and the theory of substitutions ought to show us the nature of these compounds.*

Experiment only has decided, and it has just proved that the theory of substitutions has nothing to do with the question. Indeed by distilling hydro-bromate of chloro-bromo-napthalose, it loses its bromine in the state of a simple body, and not of hydro-bromic acid.

Potassa removes one part of the bromine in the state of bromine, and one part in the state of an hydracid.

Moreover, if I formerly said that compounds of napthaline contributed to support the theory of substitutions, it was because I believed that the twelve or fifteen compounds of chlorine and bromine, to which it gives rise were converted by the chlorine into chloro-napthalose. I have just ascertained again that this reaction never occurs, and that chloro-napthalose and chloro-napthalise are only products of destruction by heat.

9th. Sulpho-chloro-napthaline is an uncrystallizable, pulverulent body.

Its formula appears to be $C^{40}H^{12}Cl^4+S^2+H^6O^4$.

It is prepared with hydro-sulphate of ammonia and hydro-chlorate of chloro-napthalise.

INVESTIGATIONS CONCERNING THE QUANTITIES OF HEAT DISENGAGED IN CHEMICAL COMBINATIONS.*

LETTER FROM M. HESS TO M. ARAGO.

The complaisance with which you were kind enough to devote yourself to investigations among the papers of your late friend, M. Dulong, in consequence of a communication which I had the honor of making to you, induces me to hope that you will pardon me for troubling you again. You will have perceived by my first letter, that I am occupied with the same subject, and that M. Dulong had engaged me to await the publication of his investigations to continue my own. I have since resumed this work and I have ascertained that by operating in a certain manner, very uniform results may be obtained. It is the nature of these substances, that the greater the quantity of the substances employed for combustion, the more certain becomes the result. It certainly would be easy for you to find in M. Dulong's notes, the volumes of oxygen which he ordinarily employed. This, which cannot fail to be found among his papers, it would be very important to know. At all events, M. Cabart, who has given you much information relative to the apparatus for combustion which he made use of, will know where the gasometers are to be found, and what was their volume. Many of my results perfectly agree with those of M. Dulong. I shall publish them when they are complete, with all the details of the experiments and apparatus, seeing that these fundamental data require to be perfectly established: they are too expensive and tedious for one not to endeavour to render a repetition of them superfluous.

Permit me to communicate to you some results analogous to the subject of this letter, which, I hope, will deserve your attention. I had formerly found that, when two substances combine in several proportions, the quantities of heat disengaged by these different combinations are found to be in a simple and multiple relation. The importance of this fact, the enunciation of which I consider as a general law, compelled me to repeat these experiments with care: the following are the results of them. The heat disengaged is expressed by the quantity of water that one part of acid (always supposed to be anhydrous), raises from 1° centigrade.

Acid employed.	Water added.	Heat disengaged.	Multiples.
$\dot{S}$	$\dot{H}$	311·86	8
$\dot{H}\,\dot{S}$	$\dot{H}$	77·86	2
$\dot{H}^2\dot{S}$	$\dot{H}$	38·9	1
$\dot{H}^3\dot{S}$	3$\dot{H}$	38·9	1
$\dot{H}^6\dot{S}$	x$\dot{H}$ (excess of water.)	38.9	1

If, instead of acting directly, by producing the combination of water and sulphuric acid in fixed proportions, the acid (of the composition indicated in the table) be mixed with an excess of water, sufficient to disengage all the heat of the mixture of

* *Compte Rendu de l' Academie des Sciences*, No. 19.

acid and water, the following numbers are obtained: —

Acid employed.	Heat disengaged.	Multiples.	Differences.
S	513·96	13	8
H S	194·56	5	2
H^2S	116·7	3	1
H^3S	77·8	2	1
H^4S	38·9	1	

I intend to resume these experiments again hereafter with the view of arriving at the most accurate results possible: for the present, the most essential thing was certainly to discover a general relation which will allow us to interpret successfully the ulterior investigations. These investigations have led me to the following law: —

A combination having taken place, the quantity of heat disengaged is unvarying, whether the combination is effected directly, or indirectly and at several times.

If a base be saturated with sulphuric acid, it is found that strong acid disengages more heat than weak: but, let the quantity of heat disengaged by the weaker acid be added to that disengaged by the water, to bring it to that state of dilation and an uniform number will be obtained.

Acid employed.	Heat disengaged. By Ammonia.	By Water.	Total.
H S	595·8		595·8
H^2S	518·9	77	596·7
H^3S	480 5	116	597·2
H^4S	446·2	155·6	601·8
		Mean	597·8

I add the cyphers furnished by potassa, which were the most difficult to verify.

Acid employed.	Heat disengaged. By Potassa.	By Water.	Total.
H S	597·2		597·2
H^2S	527·1	77·8	604·9
H^3S	483·4	116·7	600·1
H^4S	445·4	133·6	601·8
		Mean	601

Similar results are obtained with soda and lime: all these bases, with sulphuric acid, disengage the same quantity of heat. This leads me to speak of thermo-neutrality; but as I cannot do so without exceeding the limits of this letter, I reserve this subject for another time.

If the laws of multiple proportions be applied to M. Dulong's investigations, it will be perceived that the heat disengaged by the combustion of the neutral carbon is governed by this law, and it is found that in the formation of carbonic acid, the quantity disengaged by the first atom of oxygen, is to the quantity disengaged by the second as 3 : 2. There is a similar relation between the two oxides of copper. Let us apply this to the combustion of coal in high furnaces, and we shall find, that two atoms of oxygen, employed to produce oxide of carbon, disengage 6° of heat; while they would disengage but 5° if they were employed to produce carbonic acid. It may be asked why oxide of iron, mixed with charcoal and strongly heated, does not continue to operate the combustion of the charcoal, and was not reduced to iron. Let us admit, for the heat disengaged by the oxygen combined with the iron, a similar proportion as for the charcoal, and we shall find that if the peroxide of iron is $2Fe+O$, the whole heat, disengaged by the three atoms of oxygen, will be 8°, whilst these three atoms employed to produce the protoxide, would have disengaged 9° of heat. They contain, therefore, no more than ⅛ of disposable heat, which would appear to be insufficient for keeping the mixture at the required temperature. The result is not conclusive in this case, because the number of atoms of oxygen is very limited. But we will consider gunpowder, or a mixture of saltpetre and charcoal. Why does it burn so easily? We will suppose, with nitric acid, a series analagous to that which we have given above. Be the quantity of heat disengaged by the first atom of oxygen, 16°, by the second, 8, by the third, 4, by the fourth, 2, by the fifth, 1. The sum of heat disengaged would be 31°, whilst the whole heat would be 5 x 16, or 80. The combination contains the ⅛ of disposable heat, which, if we take into consideration the heat corresponding to the excess of affinity of the carbon for oxygen over that of azote, sufficiently explains to us the heat disengaged by the combination of the mixture. One of the cases most frequently requiring explanation, is that of knowing if a combination of three atmospheres (such, for instance, as $\dot{M}\ddot{s}$), is $R+2O$, or $RO+O$. In all chemical decompositions, the quantities of heat disengaged are commonly neglected. For example, we think that the preparation of oxygen is sufficiently explained to us by the following equation: $\dot{M}\ddot{s}$ and $\dot{H}\ddot{S}=\dot{M}\ddot{s}\ddot{S}+$ H and O and H. If these formulæ were the exact translation of the phenomenon, the heat necessary to produce decomposition would be uniform from the beginning to the end of the operation: but it is not so. The

experiment has only to be made with a spirit-lamp, which allows of the heat being well regulated, and it will be found that the operation is divided into two very distinct periods. The formulæ 2 $\dot{M}n$ and 3 $\ddot{H}$ $\ddot{S}$= $\dot{M}n$ $\ddot{S}$+$\ddot{H}$ and O and 2 H are first obtained: that is to say, but one-fourth of the oxygen of the peroxide ($\dot{M}n$) is disengaged. If the heat be then very considerably augmented, exactly the same quantity of oxygen is obtained as at the first time, more hydrated sulphuric acid, and you have, finally, $\dot{M}n$ $\ddot{S}^2$+H=2 $\dot{M}n$ $\ddot{S}$ and H S.

The second law mentioned above, conducts us to no less interesting results. In *The Athenæum*, No. 620, Dr. Ure published some investigations on the quantity of heat disengaged by various kinds of pit-coal. From these experiments he draws the conclusion that the present method, which consists in measuring the useful effect of a combustible by the quantity of oxygen required for its combustion should be laid aside. Dr. Ure found that the more hydrogen pit-coal contained, the less heat it gave, which he attributed to the formation of vapours, which absorb a portion of the caloric. I appreciate this experiment so much the more, as the author, who did not know the cause of it, gives an evidently incorrect explanation, seeing that final combustion gives, foreign matters being abstracted, only gases. Now, it is thus: the sum of heat corresponding to a certain quantity of water and carbonic acid, which we suppose to result from combustion, being unvarying, it is evident that if hydrogen were previously combined with the carbon, this combination could not occur without disengagement of heat: this quantity being thus already eliminated, would no longer be found in the quantity disengaged by the final combustion. From this results the very simple practical rule *that a combustible compound always disengages less heat than its elements, taken separately*. A glance at M. Dulong's experiments will be sufficient to convince you that they coincide very well with this mode of interpretation. When we are better acquainted with the quantities of heat disengaged by the combination of several elements, the quantity of heat disengaged by the combustion of an organic substance will then become an important element, and one which will lead us to a more intimate knowledge of its constitution. I am fully convinced that we shall have a precise idea of chemical phenomena only when we are able to indicate in our formulæ the proportions of caloric as we now do the relative cyphers of ponderable atoms: at least, thermo-chemistry promises to unveil to us the yet hidden laws of affinity.

ON A NEW COMBINATION OF CHLORIDE OF PLATINUM AND AMMONIA, CONSIDERED AS THE RADICAL OF THE SALTS OF GROS.

BY M. JULES REISET.

Proto-chloride of platinum, treated by liquid ammonia, is rapidly converted into a very deep green matter, giving rise to a considerable elevation of temperature. This green powder, put on a filter and washed, resembles in all respects the green salt discovered by Magnus, the formula of which is R Cl^2 Az^2 H^6, and which has, like it, the property of giving, with nitric acid, the series of remarkable salts discovered by Gros.

If, instead of limiting the action of ammonia on proto-chloride of platinum to the production of Magnus's salt, it be boiled, taking care to replace the ammonia as fast as it evaporates, the green salt concludes by being completely dissolved, and the liquor evaporated in a suitable manner, gives, by cooling, a fine crystallization in needles. Magnus's salt, treated directly by ammonia, gives rise to the same crystals.

These crystals, which are soluble in water and ammonia, are precipitated by alcohol from their solutions. Heated in a tube, they disengage ammonia at a temperature approaching 250°; thick vapours of hydrochlorate of ammonia very soon condense on the sides of the vessel, and, towards the end of the calcination, it is easy to detect the presence of free hydro-chloric acid: the non-volatile residue is perfectly pure metallic platinum. Potassa, without heat, does not disengage ammonia; its presence is rendered evident only by long boiling with that re-agent. The analysis of this body induces me to give it the following formula:

$$Pt\ Cl^2\ Az^4\ H^{12}:$$

that is, one atom of proto-chloride of platinum combined with two atoms of ammonia.

If we return to the formula of the salts obtained by Gros, by acting with nitric acid on Magnus's green salt, it will be seen that the body which I have just described is a radical, which, when united with oxygen, acts as an energetic base, capable of saturating acids, and of producing with them the salts of Gros.

The general formula of the salts of Gros is represented by—

$$Pt\ Cl^2\ Az^4\ H^{12},\ O+A;$$

$Pt\ Cl^2\ Az^4\ H^{12}\ O$ being the base capable of saturating a quantity of any acid represented by A.

I was easily convinced that the body of which I speak acts as a radical. When

* *Compte Rendu de l'Academie des Sciences;* June 1st, 1840.

treated by nitric acid, at a gentle heat, reddish vapours are disengaged, and the filtered liquor allowed a salt to crystallize which has the same composition as the nitric salt described by Gros, namely,

$$Pt\ Cl^2\ Az^4\ H^{12}\ O,\ Az^2\ O^5.$$

The chloride of the radical, or the hydrochloric salt of Gros, is most easily obtained by passing a stream of chlorine gas into a solution of the body, the method of preparing which I have given above: this chloride being very little soluble in water, is precipitated under the form of a crystalline powder, the composition of which exactly corresponds to the hydro-chloric salt of Gros: its formula is $Pt\ Cl^2\ Az^4\ H^{12},\ Cl^2$: it is the chloride of the radical.

The existence of this radical, which Gros merely glimpsed at, and which I have been so fortunate as to discover, explains in the simplest manner, this series of interesting salts.

I shall endeavour to ascertain whether, under certain circumstances, perfectly neutral bi-chloride of platinum, yields combinations analogous to those formed by the proto-chloride.

I shall likewise return in greater detail to certain properties of the body whose existence I have just announced.

II. CHEMICAL MANUFACTURES.

ON THE PRESERVATION OF WOOD.*

BY M. A. BOUCHERIE.

The author, in the investigations which form the subject of this memoir, had the following objects in view:—

1st, To ensure the preservation of wood, by enabling it to resist at once the destructive effects of atmospheric agents, and the attacks of insects:

2nd, To give to the wood, when required, in a durable manner, elasticity or suppleness, equal or superior to that which it possessed in the recent state:

3rd, To prevent it from warping, when used:

4th, To diminish the inflammability and combustibility of wood used in building:

5th, To dye, in the mass, wood intended for cabinet making.

The nature of the substances employed, varies according to which of these objects it is intended to fulfil; but the process by which the matters that produce the desired effects, are made to penetrate to the interior parts of the wood, is always the same: it consists in the employment of the vital power of vegetables, which remains some time after they have been separated from their roots.

When M. Boucherie commenced the trials of his process, he was unacquainted with any work of a similar nature: since then, however, he has learned that experiments have been tried on herbaceous vegetables, and on young branches, with the view of ascertaining, by the absorption of coloured vegetable solutions, the direction which the sap follows in its course. These investigations were undertaken with a purely scientific object; and no one before him has ever had the idea of making use of the vital power of vegetables, and of converting it into a manufacturing power, by the assistance of which it would be possible to introduce into the whole mass of wood certain matters capable of effecting its preservation, and of endowing it with fresh properties.

The operation may be performed on a tree, whilst it is yet standing; for, by making a transversal section, by means of which the sap vessels are put in contact with the solution which it is desired they should absorb, it may be managed on two opposite points of the wood, that the trunk may retain its vertical position. This method of operating, diminishes the expense, renders the impregnation quicker, and is what M. Boucherie prefers, when circumstances permit. When the tree is completely separated from its stump, the aspiring power (*force aspiratrice*) diminishes from the moment at which it is cut down; but after two days, and perhaps even more, impregnation may again take place.

The aspiring power varies according to the time of year; but all kinds do not vary in the same manner. In general, however, autumn is the season in which it is most energetic.

The quantities of different liquors which a tree may absorb, are very considerable: but the absorption of neutral solutions is much more abundant, than that of acid or alkaline solutions.

The penetration, however, is never complete with ligneous vegetables. In white woods there is always found a central tube, of variable diameter, which resists impregnation. In hard woods, it is the most central parts of what is called the core, which retain their natural state. In the same species there are, in this respect, differences

* *Compte Rendu de l'Académie des Sciences*, May 4, 1840.

which are doubtless partly attributable to age, but which may also be owing to other causes, not yet thoroughly investigated.

Having discovered that autumn is the most favourable time of year for impregnation, the author enquires whether this season would not be also the most advantageous for cutting down trees which are to be subjected to preservative operations. Trees are generally cut down in winter, in the idea that having at that time less sap, they may be dried quicker and more completely. M. Boucherie considers this process as objectionable. He has ascertained, indeed, that when the vessels which contain the sap, divided by the cutting instrument, are not put in contact with a liquid, they do not the less exercise an absorbent action: but it is from the air which they let in, and in greater quantity, as the vegetable life is more active at that time.

Having measured, by means of a very simple apparatus, the volume of air absorbed by a branch, under the most favourable circumstances, he found that it was almost equal to that of the branch itself. He says that this air is evidently substituted for the water which is evaporated by the leaves, and its introduction into the interior of the wood cannot fail to hasten its desiccation. Such a fact as this, he adds, must convince us that autumn, and not winter, is the time for cutting down the trees, and that it is best not to allow the leaves to fall off first.

We have said that the substances which are caused to penetrate into the interior of wood, by means of the aspiring power, which, during the life of vegetables, regulates the ascending of the sap, varied according to circumstances: it now remains for us to make known the matters employed by the author, in the different cases enumerated above.

OF THE PRESERVATION OF WOOD.

M. Boucherie sets out from the principle that all the alterations which wood presents arise from soluble matters which it contains, and which cannot be completely removed, even by long-continued washings: his object, therefore, was to find chemical agents which would convert these matters into insoluble compounds.

Crude pyrolignite of iron, which is very cheap, seemed to him to answer the purpose in all respects, and its advantages have been confirmed by the results of various experiments, the details of which are given in his Memoir. We content ourselves with giving the following:—

Hoops of casks, made of chestnut wood, become rotten, as is well known, after having been a very short time in cellars: they present, therefore, a means of forming a comparison of the resistance of natural wood and prepared wood.

A commission was named by the prefect of Gironde, for pursuing experiments undertaken with this view: in his presence, in the month of December 1838, prepared hoops and hoops of commerce in their natural state, were placed upon the same casks; these casks, which were deposited in the dampest parts of a cellar, were visited on the 8th of August 1839: the hoops which had not been prepared by M. Boucherie's process were completely rotten, whilst the others had not undergone any appreciable alteration.

The employment of pyro-lignite of iron has the effect not only of preserving the wood from the destructive effects of the atmospheric agents, but also of rendering it more capable of resisting mechanical ones.

OF THE FLEXIBILITY AND ELASTICITY OF WOOD.

These qualities, says M. Boucherie, are particularly required by the navy; and wood which presents them and retains them longest, offers such guarantees of service and durability, that it does not hesitate to pay a very high price for it.

Although in many cases the organic constitution of wood, and, in certain circumstances, even its chemical composition, may contribute to preserve its suppleness and elasticity, still these properties are more intimately connected with the proportion of moisture which it retains: to preserve them has been one of M. Boucherie's principal objects. This object he says he has attained by means of solutions of deliquescent salts, introduced by absorption. Besides, these salts act not only as preservers of humidity; they seem also to act in the same manner as oily bodies, giving to the wood a flexibility which is even superior to that which it possessed when first cut down.

After various trials, M. Boucherie ascertained that saline supernatant liquors, formed principally of deliquescent chlorides, answer the purpose very well, and he has thus given value to a product which, before, was perfectly useless. He observes that to obtain the greatest effect, it is necessary that the saline solutions be very concentrated.

Although he has every reason to believe that these saline solutions are sufficient to preserve wood, he advises, for greater security, that one-fifth of pyrolignite of iron be mixed with them.

OF THE WARPING OF WOOD AND OF THE MEANS OF PREVENTING IT.

Wood increases or diminishes in volume under atmospheric influences, and when it is used without being sufficiently dried,

these changes are very great and produce very disagreeable effects.

Builders, therefore, have long directed their efforts, but without any success worthy of notice, towards the means of accelerating the desiccation of wood, which is very slow when left to operate naturally. However, says M. Boucherie, no one has ever asked whether this state of siccity was the state which alone could prevent wood from warping, being of opinion that the alterations in volume were attributable to the wood containing matters which have an affinity for water, and which, by turns, yield it to, and acquire it from, the surrounding atmosphere. He thought that if these kinds of sponges were kept saturated with moisture, their volume, and that of the mass would remain invariable. Now, the means of carrying this into effect is very simple. It is sufficient to profit by the aspiring power of the wood, to impregnate it with the deliquescent chlorides. Experiments made with this view were attended with complete success.

ON THE MEANS OF DIMINISHING THE INFLAMMABILITY AND COMBUSTIBILITY OF WOOD USED FOR BUILDING.

From the time that M. Boucherie ascertained the possibility of always preserving a certain moisture in wood by impregnating it with earthy chlorides, it was easy to foresee that by means of the same substances we might not only very much diminish its inflammability, but also impede the combustion of its carbon, being withdrawn from the contact of the air by the fusion of the earthy salts which is operated on its surface and in its mass. This has been fully confirmed by the results of various experiments. Wood prepared by this means prevents the possibility of fires, except, however, in cases where the fires would be not only provoked but fed by matters foreign to the construction of the building.

OF THE INTRODUCTION OF COLORING MATTERS INTO WOOD.

This may be effected by mineral or vegetable substances. In the former case a substance already colored is not introduced; but bodies, whose mutual decomposition causes the formation of a third colored body, are successively applied. Thus, blue is obtained by passing, one after another, a salt of iron, and prussiate of potassa.

M. Boucherie has observed, with respect to vegetable coloring matters, that they do not penetrate the tissue of wood with the same facility as the preceding: certain woods even refuse to receive them, however limpid the solutions may be.

REPORT CONCERNING M. SELLIGUE'S MEMOIR RELATIVE TO NEW PROCESSES FOR MANUFACTURING LIGHTING GAS *

BY MM. THÉNARD D'ARCET, AND DUMAS.

The Academy of Sciences appointed us Commissioners to make a report to it concerning M. Selligue's Memoir relative to the distillation of schists and to the application of the oils thus furnished, to the preparation of lighting gas, which the author obtains by methods of his own invention: we now fulfil this duty.

M. S. turns to profitable account a mineral substance until now very little looked after, which, notwithstanding, is very deserving of attention: he uses, in great quantity, the bituminous schist which is met with in the department of Saône-et-Loire, between Autun and the central canal. Three manufactories for working this new invention have already been established by M. Selligue: one at Saint-Leger-du-Bois, canton of Epinac; another at Surmoulin, canton of Autun; and the third at Igornay, canton of Cardesse.

In these manufactories the bituminous schists are subjected to distillation in close vessels. They leave a residue of carbonaceous matter, capable of being used as disinfecting or decoloring charcoal. These schists yield, as volatile products, oils consisting essentially of various carburets of hydrogen: these are the matters turned to account. There are disengaged, besides, during the distillation of these schists, inflammable gases, which are directed into the tube of the furnace, to render them useful as a combustible to assist in the operation itself.

Among the schists of Autun masses of very different richness are met with. Every thing which furnishes less than 6 per cent. of oil to distillation is rejected. The matters most commonly worked yield 10 per cent. on the average: but it is not uncommon for them to produce 20, or even 25, per cent., and certain varieties will produce as much as 50 per cent. of their weight, of oily matter.

These details are sufficient to show the interest with which such a remarkable product should inspire, not only geologists and manufacturers, but also chemists.

What, it may be asked, is the nature of the matter which exists in these schists, and which, though perfectly dry and solid at the ordinary temperature, yields to distillation proportions of oil amounting almost to three-fourths of its own weight?

The following is the composition of the

* *Compte Rendu de l'Academie des Sciences*, June 1st, 1840.

oily products extracted from these schists by distillation:—

1400 kilog. of liquid bitumen, the average daily produce of two manufactories, are composed of

498 of a light oil of a density varying from 0·766 to 0·810: it is this which is applied to the production of the gas:

362 of a much more fixed oil, capable of being used for the lighting of lamps:

168 of a matter containing 12 per cent. of paraffine:

242 of pitch or tar.

1300*

The furnaces with which M. Selligue obtained these different products present very ingenious arrangements, and might be turned to account in many analogous operations, for instance, in all those wherein dry distillation, on a large scale, is required.

The various substances extracted by M. Selligue from the schists of Autun, by means of this operation, will eventually find their place in the arts. At present we would call attention to the lightest and most volatile oil, for it is on that that the manufacture of the lighting gas is founded.

It has long been suspected that lighting gas owes its illuminating properties essentially to oily vapours, which accompany the hydrogen gas, generally containing a small quantity of carbon, which always predominates in the composition of this gas: this opinion is demonstrated by the result at which M. Selligue has arrived.

Many distinguished men of science, who have made the preparation and properties of lighting gas the subject of very attentive study, have been induced to establish as a principle, that carbonic oxide is always prejudicial in the composition of lighting gas; that it diminishes the brilliancy of the flame by lowering its temperature, on account of the very slight heat developed by its combustion. This opinion is unfounded. In this respect the processes adopted by M. Selligue do not leave the least uncertainty.

These two essential points of the theory of lighting gas receive, therefore, from M. Selligue's experiments, a solution which should give rise to modifications in the course adopted for the manufacture of gas by the old processes, where it is evidently directed according to principles which are not yet confirmed.

M. Selligue effects the preparation of his gas as follows:—

Three tubes, vertically situated in a furnace constructed on a novel and very ingenious plan, are heated to redness. The first and second contain charcoal, and as this charcoal disappears it is replaced—an operation which is performed every five hours. This charcoal is used for the purpose of decomposing the water which is introduced into the first tube, where it is transformed into hydrogen and carbonic acid, or carbonic oxide. But as it is important to avoid the production of carbonic acid, the gases yielded by the first tube are directed into the following tube, where they again come in contact with incandescent charcoal, by aid of which the carbonic acid at first formed is brought to the state of carbonic oxide. By the contrivance of the furnace this tube is the hottest of the three, which favours the decomposition of the carbonic acid.

The third tube is filled with iron chains, the object of which is to present a greater incandescent metallic surface, in order to distribute the heat in an equal and rapid manner, to the gases or vapours which traverse it.

It receives, on one part, the gases arising from the decomposition of the water, effected in the two preceding tubes; and on the other, a continuous stream of oil of schist. This oil is decomposed into new and more volatile products, and passes entirely with the gas into a cooler, which, by cooling the products, causes some of it to re-appear.

The oil of schist, therefore, is not entirely converted into gas; but that which is not changed into matters possessing the functions of gas, is found intact. It is worthy of remark, that the links of the chain contained in the tube are not covered with any carbonaceous deposit. Thus, although the oil of schist is manifestly decomposed by heat in this operation, its decomposition is exceedingly well modified by its diffusion in the midst of so great a volume of gas, as that arising from the decomposition of water, which also serves as a vehicle for it.

There go out, therefore, from the third tube, hydrogen and oxide of carbon, resulting from the decomposition of the water, and the gases or vapours arising from the decomposition of the oil. By putting into the apparatus 4 quarts of water and 5 quarts of oil per hour, 210,000 quarts of gas fit for lighting may be procured in twenty hours.

Gas, thus prepared, does not require any purification besides that which it gets in its passage through a cooler in which the undecomposed oil is condensed, as well as the stream which has also resisted decomposition.

From the cooler, the gas is passed into the gasometer.

M. Selligue's process is so simple, and requires only such a small and cheap apparatus, that it may be considered as emi-

* This seems to be erroneous; it should be 1270.—Editors.

nently calculated to supply the wants of manufactories and private establishments, when the proprietors wish to manufacture the gas required for their own consumption.

Moreover, the price of gas, thus prepared, seems sufficiently low, for it to be used for lighting towns.

It is important to take notice of the two following facts:—

Experiment has proved that, far from being impaired in its properties at a distance from the gasometer, gas, thus obtained, is improved at 8,000 metres from the reservoir, it presents a purer flame than at the gasometer itself.

When cooled to 25° (centigrade) below zero, its illuminating power was not perceptibly diminished.

These two facts were requisite to be proved in treating of a gas, whose illuminating power evidently depends on the presence of combustible hydro-carburetted vapours, which would be completely deposited by cold, by repose in long pipes. Experiment has shown that, if any is deposited under such circumstances, there always remains sufficient to produce the required effect.

A lamp of this gas, giving a light equal to a Carcel's lamp, consumes from 105 to 120 quarts of gas per hour.

As this gas is perfectly free from the sulphurous compounds which give so much smell to ordinary gas, it does not spread any disagreeable odour. Moreover, it does not act on metallic reflectors, which has enabled M. Selligue to combine the use of them with that of his gas, so as to light a city in the most powerful manner: for a parabolical reflector, adjusted to one of his lamps, carries to the distance of 80 metres (262·47 English feet) a light sufficient to enable one to read common-sized printing.

MM. Thenard, D'Arcet, and Dumas, the Commissioners appointed by the Academy of Sciences, have examined by themselves the apparatus fitted up by M. Selligue at the *Imprimerie Royale;* that established for lighting Dijon; and that with which Les Batignolles are now lighted. They have gathered information concerning the apparatus which M. S. has set up in other towns.

It has been demonstrated to them that M. Selligue has rendered an indisputable service, by showing every thing that can be extracted from bituminous schists, by means of dry distillation: and by adding, in order to affect this, apparatus of excellent construction, invented by himself.

They are also unanimously of opinion that M. Selligue has been able to turn to most advantageous account the decomposition of water, by means of charcoal, in order to produce, by means of cheap oily substances, the greatest quantity of lighting gas they are capable of producing, whose combination is of his own invention, and whose effect leaves nothing to be desired.

The efforts made by M. Selligue deserve, therefore, the attention of the Academy, which, perhaps, will be kind enough, by its approbation, to encourage him to persevere in the new plan which he has entered into, and wherein he has already obtained undeniable success.

The conclusions of this report were adopted by the Academy.

REMARKS ON THE FORMER USES OF PURPLE OR SCARLET COLOURING INSECTS. NEW COCHINEAL OF PERSIA AND ARMENIA.

BY M. J. J. VIREY.

Before the discovery of the Mexican cochineal (*coccus cacti coccinelliferi*), the ancients knew how to obtain a purple dye, not only from the univalve shell-fish, called murex, but also from several insects. A purple dye is spoken of in the Bible; and every thing tends to convince us that it was not extracted (at least not entirely) from the kermes, or *coccus ilicis*, but from a cochineal procured from Armenia and Persia, formerly known to travellers and merchants by the name of *tschrew*. This term signifies a little red worm, like our word vermillion, and like the word scarlet (or *scharlath* of the Germans) comes from *kermesinas*, &c. *

This cochineal was not well known to naturalists, until the publication of the recent Memoir of M. Brandt. † It abounds in Erivan, and the valleys of Ararat; parts of Persia and Armenia, now incorporated with the empire of Russia. It is particularly common in the swampy meadows surrounding Araxis, and fixes on the root of the *Poa Pungens*, or the *Oeluropus Lævis* of Trinius.

It is evident, therefore, that its habits resemble those of the *Coccus Polonicus*, described by Breyn, which grows on the *scleranthus perennis:* but the Armenian cochineal is much thicker than the Polish: it requires but from 18 to 23 thousand individuals to weigh 360 grammes, or a pound (of 12 ounces), whilst it requires 100, and sometimes 130 thousand of the *Coccus Polonicus*, for the same weight. Mexican cochineal runs 20 to 25 thousand to the pound: therefore it presents scarcely as much colouring matter as the Armenian; but the

* Hamel. *Mem. Acad.* Petersburgh. Sixth series, vol. 3.

† Ibid., anno 1835. He has discovered a new race, named Porphyrophora.

Polish gives the least (it is the *Porphyrophora Frischii.*)

According to Brandt, Armenian cochineal (*porphyroph. Hamelii*) is distinguished by thirteen or fourteen articulations to each antenna, in the male, and a brush of hair at the anus. The female, in the state of larva, lives in a shell attached to the root of the plant: it can dig the ground with its fore paws. When perfect, the mouth is entirely obturated, as in the Polish kermes; for these animals are of the same genus, although they are of different species.

We may also mention, among tinctorial insects, the *trombidium tinctorium* Fahr. (*acarus tinct.* of Linnæus), which is common in hot climates, as in Senegal and Sennaar, according to Caillaud, and particularly in Guinea, where it has begun to be made use of in dyeing.*

The Carapathos, very small red acarus, like our roach, are immensely numerous in the woods and thickets of Brazil†, Paraguay‡, and French Guinea,§ and a beautiful colour might also be extracted from it, were it not for the insupportable itching which they occasion on the skin. However, the vapour of vinegar causes them to perish easily.

The beautiful butterflies, or the coleoptera which it is desired to preserve uninjured for collections, may be killed by putting a drop of acetate of strychnia in either the trunk or the mouth. The insect falls motionless without spoiling its shape.‖

ON THE DESICCATION OF BEET-ROOT BY COLD.¶

BY MM. BONAFOUS AND PAYEN.

Although M. de Lirac's ingenious process for drying beet-root by the solar heat may be successful in Southern countries, it is inapplicable in Northern ones, and requires much caution even in the former where storms are frequent and unexpected.

M. Payen and myself proposed to find out some means of drying beet-root in Northern countries, which are the best adapted to its culture. We at once thought of congealing the roots, which, disaggregating the tissues, facilitates the evaporation of the water of vegetation. Our first attempts, made in Piedmont on entire roots, proved to us that the time necessary for desiccation in the open air would be too long to be operated during frost, and that after the thaw the effused juices would rapidly be spoilt. Then, trying to expose to frost slices of the root, during the last frosts which existed in Paris, we obtained a desiccation sufficiently advanced to ensure preservation, or at least to allow of the drying being completed, in a current of air, more or less warm. The crystallized sugar did not undergo any alteration, which may easily be conceived, since the water which is a chief cause of the injurious reactions, had, in great measure, been eliminated at a low temperature.

I hasten, whilst we are repeating our experiments, to communicate the result of this first attempt to the Academy of Sciences, with the view of calling the attention of experimentalists to a process which, when perfected, may present new resources to one of our most important manufactures. This mode of desiccation would have the advantage of spreading, in the country part at least, of the sugar manufacture, which is so fertile in results of many kinds. Agriculturists themselves might prepare a matter easily preserved, valuable enough to bear the expence of carriage, and sufficiently rich in sugar to furnish that product in abundance without much trouble.

ON A MEANS OF DETERMINING THE LENGTH OF TIME AN IODIZED PLATE SHOULD REMAIN EXPOSED TO LIGHT, IN ORDER TO GIVE A GOOD PHOTOGRAPHIC IMAGE.

BY M. SOLEIL.

The alterations in color which chloride of silver undergoes by the action of light may be turned to account, in fixing the time necessary for the production of photogenic images, since the same portion of radiation gives rise to each.

After many unsuccessful attempts, I stopped at the apparatus of which the following is a description:—

A brass tube, 40 millimetres long and 25 in diameter is taken: it is blackened internally, open at one of its extremities, and closed at the other, by a moveable plate, before which a card is slipped; on this card, previously covered with gum, or dextrine, there is applied, with a spatula, a

* Slubber, Observ. microscop. in aranea holosericea, tab. 2.

† Maximil. de Neuwied, Voyage to Brazil and Bahia, vol. iii. pp. 188, 189.

‡ They are called *Vinchuca*, according to Azara. *Voyages*, vol. 1. p. 208.

§ Piérre Barère. *Equinoctial France:* they are called *ticks*.

‖ The inhabitants of Santa Fé hunt these insects to eat them. They make omelettes of them, or, after having fried them, they cover them with sugar, to make comfits of them. Azara, *Voy. Merid.* tom. i. p. 199. It is *tanachoura*, Max. de Neuwied, *Voy.* vol. 1. p. 77. and vol. 2. p. 263. et seq.

¶ *Compte Rendu de l' Academie des Sciences*, May 4th, 1840.

layer of moist chloride of silver, of about a millimetre in thickness; it is kept, for this purpose, in a glass flask covered with black paper.

The tube, thus disposed, is turned from the side of the object of which we wish to take the image, and the time that the chloride of silver takes to become of a greyish slate color is reckoned. This time is equal to that during which the iodized plate ought to be kept in the camera obscura.

PHOTOGRAPHIC DRAWINGS OBTAINED ON SILVERED PAPER.

BY M. RAIFE.

According to M. Raifé, the substitution of silvered paper presents considerable economy; and it offers this advantage for travellers, that drawings, having once been fixed by means of hyposulphite of soda, may be kept like ordinary drawings in an album.

The silvered paper should be stuck on a card: afterwards, when it is dry, it is sprinkled with fine tripoli and rubbed with cotton. The iodizing is effected as quickly and as well on this paper as on metallic plates, and the action of light in the camera obscura is quite as rapid.*

ON A PROCESS FOR FIXING PHOTOGENIC DRAWINGS.

EXTRACT OF A LETTER FROM M. PRESCHOT TO M. ARAGO.

In one of the sittings of last month you mentioned a process for fixing photogenic images on metal (see *The Chemist*, No. VI., p. 187). Knowing, as I do, the interest you take in the beautiful discovery of the Daguerreotype, I hope you will excuse the liberty I take in troubling you with results which I obtained in experiments made a few months ago.

Photogenic images, obtained by M. Daguerre's process, may be fixed by treating them with a solution of hydrosulphate of ammonia. For this purpose, a concentrated solution of this fluid is mixed with three or four volumes of pure water, which is poured into a flat vessel, in sufficient quantity that the plate may be steeped in it horizontally, and just covered with the fluid. When by the action of the fluid the tints of the drawing are sufficiently changed, which occurs in less than a minute, the plate is to be withdrawn and put into a flat vessel containing water; it is afterwards taken out and dried. By this process the polished parts of the metal are tinged grey by the sulphuret, and the amalgamated parts are not attacked, or, at least, but very little. The tints may be varied by the concentration of the fluid, or the duration of the immersion; however, too long an action turns the lights yellow. Photogenic images, treated in this manner, bear rubbing with the finger, without losing any of their details.

* *Compte Rendu de l' Academie des Sciences*, No. 21, May 23rd, 1840.

ON THE FIXING OF PHOTOGENIC IMAGES.

BY M. CHOISELAT.

Chloride, and particularly iodide, of silver, dissolved in hypo-sulphite of soda, may be advantageously employed for fixing the images of the Daguerreotype. Steeped in these solutions, they are under the electric influence exerted by the copper on the dissolved silver, and thus become ineffaceable.

Instead of the hypo-sulphite, a mixture of iodide, bromide, &c., of potassa, may be employed.

The iodide of silver best adapted for this operation is that which is obtained by treating, with the aid of heat, a plate of this metal, by the iodide precipitated from alcohol by water, afterwards dissolving the iodide formed and adhering to the plate in the hypo-sulphite.

MANUFACTURE OF CHLORINE GAS.

To the Editors of The Chemist.

GENTLEMEN,—The common method of making chlorine gas from muriatic acid and manganese, is to expose the acid and manganese together to heat, under the boiling point, in a leaden vessel or still, until all the chlorine gas is expelled. I have found, however, in operating thus, a considerable corrosion of the lead and rapid destruction of the still to be the consequence; so much so, as very much to increase the expense of manufacturing chlorine gas.

I shall, therefore, feel much obliged by any of your chemical correspondents informing me of a method of securing the lead from the attacks of the muriatic acid, or pointing out some other kind of apparatus in which this gas may be prepared at a less expense.

When manganese, common salt, and sulphuric acid, are used instead of muriatic acid, for furnishing chlorine gas, the corrosion of the lead apparatus is not so great; and this is the process usually adopted.

I am, Gentlemen,
Your humble servant,
W. S.

June 9, 1840.

III. PHARMACY, &c.

EXEMPTION OF DRUGGISTS FROM SERVING ON JURIES.

To the Editors of The Chemist.

GENTLEMEN.—As a medical reform measure is likely soon to be brought before the House of Commons, I hope I may be allowed, through the medium of your Journal, to suggest to the retail trade throughout the kingdom the propriety of trying for, and the probability of obtaining, a total exemption from attendance on JURIES, whether in courts of law, coroners' courts, or elsewhere. I have been led to the consideration of this subject from having been subjected to much personal inconvenience (too often the only incentive to public spirit) in an attendance on juries in town; and I propose the following points as powerful pleas for petitioning the legislature on the subject.

I. The "trade" must assume its proper position as *a part* of the medical profession.

Whether, in the present glorious state of confusion of the medical institutions, it be possible to define or make out what an apothecary really is, and who is an apothecary, is not very material; but it is of the greatest consequence that the legislature should be made aware of the important position, that chemists and druggists really hold among the curators of the public health. The very idea of this I am aware would graciously be sneered away by a large party of the profession, viz., the general practitioners; but let such be reminded, that between the two other branches, viz., the *lowest*, or that one very much beneath themselves (the chemists and druggists, which I most humbly admit), and the *highest*, or that composed of the PHYSICIANS, and the SURGEONS, κατ' ἐξοχην,—that between these two branches an almost equal relative importance exists, in the case of the patient, so far as conderns his being brought to a state of health. For to what purpose, I would ask, does the physician or the surgeon weigh the choice of remedies and their quantities in his experienced mind, if the raw apprentice or the inexperienced assistant (during the constrained absence of the chemist himself) is to weigh the materials of these remedies in the balance with a slovenly incorrectness?

II. I have still a stronger case to make for the justice of chemists being exempted from state service. I allude to the severity with which the law deals with them in case of fatal inadvertence or mistake.

It is natural to expect, and would of course be objected, that other trades would plead excuses for non-attendance on juries, if chemists and druggists were exempt; but where is there any occupation that exposes such risk and danger as that of a chemist in the hands of the inexperienced?

Mischances and accidents of a fatal kind, when they occur in other professions, are usually translated by courts and juries into verdicts of "accidental death," or "homicide by misadventure," as I have seen it quaintly put in some cases. But only let the hand of a thoughtless youth drop upon "Hyd. Am.-Chlor." instead of "Hyd. Chlor.," let an apprentice only read "Hyd. Bi-chloridas," for "Hyd. Chloridas," so that *death* be the result of the "misadventure," and his "attendance will be required in court" on much more unpleasant business than persons of other crafts are at all liable to,—that of hearing a verdict of "MANSLAUGHTER" returned against himself, perhaps by his fellow-townsmen!

Such are the grounds on which the chemist and druggist may, in my opinion, very justly claim to be exempted from state service, of whatever kind; and if you think the case to be really good, I hope you will afford it the assistance of your own pen; convinced that you will be ready at all times to advocate the best interests of our profession.

I am, gentlemen,

Your most obedient humble servant,

W. GALLARD, Chemist and Druggist.

Hampstead, June 15, 1840.

[We heartily coincide with Mr. Gallard, with respect to the danger, impropriety and inexpediency of compelling chemists and druggists to serve on juries. They are frequently so circumstanced, more particularly in provincial towns, as to be utterly unable to obtain an efficient assistant while absent, and are obliged to trust to an apprentice, or, not unfrequently, their wives, to the great risk of the lives, health, and safety of the community, and danger of their own reputation, added to the heavy penalties attendant on any fatal consequences arising from the ignorance of such persons. The legislature should therefore be appealed to, and measures to secure so desirable an object ought immediately to be adopted. Such appeal and measures would, we have no doubt, be successful,—at least, we think that no objection could possibly be raised which could not immediately be removed. So great an abuse ought speedily to be reformed.]

LEECH MONOPOLY.

To the Editors of The Chemist.

GENTLEMEN.—In reply to a letter which appeared in your excellent Journal for June, headed "Leech Monopoly," I would take the liberty, with your kind permission, of offering a few remarks.

At first sight it does appear singular, that this useful animal should have retained so high a price for such a length of time. There cannot be a doubt, however, that the supply of the German or speckled leech, is not, and has not been, for at least eighteen months, sufficient to supply the demands made upon the merchants. I cannot see the force of the accusation brought against the wholesale trade in leeches, neither do I think the traffic in this animal so limited as your correspondent insinuates. I think that the chief leech-holder in this country is Mr. Hudson of Hull, who many years ago succeeded to the ponds, of which he is at present the proprietor. Now, he, some months ago, failed in his stock completely, and was for a time quite unable to supply the German leeches at any price. Previous to this the value of the leech was rising, but since then it has fallen considerably. His ponds are, I believe, constructed with much care and nicety, the animal possessing every advantage. From some observations, it does appear to me, that the principal cause of the leech dying, is a string of mucus, which seems to be generated in the water, where many are kept, and this, winding round the body, acts as a tight ligature, and produces death. To obviate this Mr. H. has his ponds constructed with a division of earth between each, into which the animal burrows, and in this way gets rid of his enemy, and reaches another pond. While on this subject, I would particularly recommend, to all those who may keep leeches, to wash well two or three pieces of *open* sponge, so as to free it from taste and odour, and then to throw them into the jar amongst the leeches. By this simple means the leeches will be kept very healthy, for they creep through the open parts of the sponge, and get rid of the slime. Ever since I followed this plan myself, I have found the mortality diminished at least one half. But although Mr. H. deals so extensively in leeches, he holds no monopoly, as there are many individuals, who bring over a large stock from Hamburgh, and dispose of them in London, throughout England, or even wander with their jar as far north as this place. No greater surprise should exist regarding the high price of leeches, than there should be regarding the sudden and unaccountable rise which some drugs take. As well blame a particular druggist for the rise in camphor, which recently took place, as charge any party with a "leech monopoly." Besides, the price has fallen at least 6*s.* per 100, within a few months; and I should hope that, as the season advances, it may fall still more. And I cannot but suppose, that if any exclusiveness was practised in the disposal of leeches, the countries in which they are found are not at such a distance, neither are the modes of communication with them so difficult, but many would be ready to take advantage of and destroy it. As long, therefore, as the real speckled leeches cannot be had in sufficiently great numbers, there must be a proportionally high price attached to them.

In conclusion, I would state, that there is at present and always has been, a considerable difference in the price of the speckled and the green French leech, varying from 5*s.* to 10*s.* per hundred.

I am afraid I have trespassed on your patience, but I considered it a duty which the retail chemists were bound to perform, to reply to the letter of an "*Enquirer*."

I remain,

Your most obedient servant,

Edinburgh, I. M.

June 11th, 1840.

FORMULÆ FOR FERRUGINOUS MEDICINES.*

These medicines being now so much employed, we are induced to give, from the *Journal de Chimie Medicale*, the formulæ of those most commonly made use of.

DR. BALLY'S FERRUGINOUS LOZENGES.

Powdered iron filings	16 grammes.
Chocolate paste	16 grammes.
Powdered saffron	4 grammes.
Mucilage of gum tragacanth	Q. S.

Make with the whole of it lozenges of the weight of six decigrammes (12 grains). Three or four of them to be given every day.

LOZENGES OF CITRATE OF IRON.

Citrate of iron	10 grammes (2½ dr.)
Citric acid	10 grammes.
Essence of lemon	4 decigrammes.
Very fine sugar	160 grammes (5 ounces).
Water	Q. S.

To be made into gout lozenges of 10 grains each. Five or six to be given every day.

* *Journal de Chimie Médicale*, May, 1840.

LOZENGES OF TARTRATE OF IRON.

Tartrate of iron	1 gramme (18 gr.)
Sugar . .	32 grammes (1 ounce).
Essence of mint	2 drops.
Mucilage of gum tragacanth, Q. S.	

Make 36 lozenges, each of which contains 2 centigrammes (⅓ grain) of tartrate of iron.

SYRUP OF CITRATE OF IRON.

Aqueous solution of citrate of iron . . .	48 gr. (1½ oz.)
Sugar syrup . . .	1000 gr.

Every ounce of this syrup, the formulæ of which is given by M. Moussu, should contain 30 centigrammes (4 grains) of citrate of iron.

This syrup may be made directly by taking 10 gr. of citrate of iron, dissolving in a little water, and incorporating with it 96 grammes (3 ounces) of sugar syrup.

SYRUP OF CITRATE OF IRON.—M. BERAL'S FORMULA, 1831.

Simple syrup . .	458 grammes.
Citrate of peroxide of iron	30 grammes.
Spirit of lemon and alcohol	7 grammes.

DR. COLOMBAT'S FERRUGINOUS POWDER.

Pure sulphate of iron .	2 grammes.
Tartaric acid . . .	6 grammes.
Sugar	12 grammes.

All these substances are reduced to a very fine powder, and divided into twelve equal parts.

M. QUESNEVILLE'S FERRUGINOUS POWDER.

Analysis has shown that this powder is formed of

Bicarbonate of soda	16 grammes (4 dr.)
Tartaric acid .	28 grammes (7 dr.)
Pure sulphate of iron	16 grammes (4 dr.)
Sugar . .	32 grammes (1 oz.)

The tartaric acid is reduced to a coarse powder, as well as the bicarbonate of soda; these are mixed with the other substances, and confined in a flask. The dose is a spoonful in 250 grammes of sugared water.

SACCHARINE CARBONATE OF IRON.

To the Editors of The Chemist.

GENTLEMEN,—Amidst the number of preparations of iron, there still appears to be a deficiency, in so far as we have not a mild, and at the same time, efficient remedy. The sulphate no doubt is a powerful salt, and much employed, but rarely otherwise than in combination. The carbonate of the oxide has been long known, and most successfully employed, as a tonic, but the quantity of 3j or more, given repeatedly during the day, is so nauseating, that many have thus been prevented from taking it, and deriving that benefit, which, had it been palatable, might have resulted from its use. My object now is, to introduce to your notice, and to that of your readers, a new and very important preparation of this metal—the *Saccharine Carbonate of the Protoxide of Iron.* Although it is officinal in the last edition of our Edinburgh Pharmacopœia, it appears to be quite overlooked, for few town, and fewer of the country medical practitioners seem to be acquainted with, and the retail chemist to be equally ignorant of, the preparation; of course there are exceptions, and I may add, some of our first physicians employ it with decided advantage.

The method of preparing this compound is simple enough, but requires great care. It consists in decomposing pure sulphate of iron, by means of carbonate of soda. The carbonate of the oxide thus obtained, is to be well washed with cold water, pressed as dry as possible, and the pulp immediately triturated with finely powdered sugar. This is ordered to be carefully dried with a heat not much exceeding 150° F. For the sake of enabling any one to prepare it, I shall add a few practical hints. ℥iv. Sulph. Ferri Pur. ℥v. P. Sodæ Carb.: each dissolved in Aqua distillat. ℥xl., ought to yield about 3x. of the pulp. This added to ℥ij. Pulv. Sacchar. Alb. opt., should produce, when dried, in all ℥ij. 3vj. Proper attention to the temperature employed in drying, is indispensable, as the process will be very much lengthened, if the heat is not sufficient; and, on the other hand, if too great, it will as surely be blackened and destroyed. It will take at least 10 or 12 hours to dry it properly, in a broad evaporating basin, with a heat ranging from 130° to 160° F. It must then be rubbed to powder, but not *sifted.* I have always preserved it from light and air, which keeps it much better. It would appear to be a sesquioxide of iron, mechanically mixed with sugar, and protoxide of iron. During the drying, brisk effervescence takes place, indicating the escape of carbonic acid. When recently prepared, it ought to have a grayish-green colour, inclining to brown. Soluble in muriatic acid, with brisk effervescence. Taste sweet, but slightly astringent. Granular in appearance, easily suspended in water, but apt to precipitate if allowed to stand. The usual dose is from seven to ten grains twice or thrice daily.

It may surprise many to learn that this preparation, apparently so weak, (from the comparatively small quantity of the oxide contained in ℥j. of the powder), is equivalent, when given in the above minute doses, to 60 grains of the old carbonate, repeated three or four times a-day. When I make this statement, it is not an assumption, upon mere theory, for I am acquainted with some cases, of chronic stomach complaints, which had resisted the effects of many tonic remedies, and amongst them the Carb. Ferri Præc., but which yielded to the influence of this new compound. One case I may give in illustration. A lady about 50 had been for some years quite a martyr to deranged stomach. She complained chiefly of severe pain, in the immediate region of that organ, sickness, heartburn, slight giddiness, loss of appetite, and all the other concomitants of sympathetic nervous derangement of the stomach. Under the directions of her medical adviser, she ran the gauntlet of the most fashionable remedies. Amongst other things she took the Sulph. Ferri, combined with Ext. Hyosc., but derived more benefit from the Carb. Ferri Præc. than any other preparation. She was at last reduced to that condition that nothing afforded relief, during these painful attacks, but large and repeated doses of the latter substance. She was much averse, however, to swallowing such large quantities of this disagreeable compound, although compelled to do so in order to gain cessation from pain. About two months ago she was ordered the Saccharine Carbonate, in 7½ grain doses, repeated twice a-day. Upon finishing 12 of those powders, she experienced great relief, and ere she had finished 48, (increased in quantity to 10 grains, and taken three times a day,) she was completely freed from a pain which had not, until then, been entirely absent, for some years. I have given you this instance, in the hope that it may induce some to try its powers, wherever a chalybeate is wanted.

I am not aware of this salt having been as yet employed in any other cases of disease than stomach affections; but might it not very easily be combined with myrrh and aromatics, formed into pills, and administered, instead of the nauseous Mist. Ferri co.? The numerous advantages which this preparation appears to possess, are such, that I am sanguine enough to suppose, that it may soon be used as an emmenagogue, and in fact in all those cases in which the use of iron is indicated. In speaking of the Saccharine Carbonate, one thing must not be lost sight of, namely, that it will be found a most elegant and pleasant mode of giving iron, few if any objecting to its taste, which is a great desideratum. I send you herewith a small portion in order that you may see the marked difference, which exists, between this and the old preparation.

At present I add nothing more, I am only afraid of having encroached too much on your patience,

I have the honour to remain,
Gentlemen,
Your most obedient servant,
I. M.
Retail Chemist.

Edinburgh, June, 1840.

[This is by far the most elegant and effective preparation of iron we have seen for some time, and as such we feel we can safely recommend it to the notice of our readers. It is sweet, and perfectly free from nauseous taste. It may be taken by the most fastidious persons without any inconvenience.]

FORMULÆ FOR THE EMPLOYMENT OF LACTATE OF IRON.

BY M. A. CAP.

Lactate of iron, which the investigations of MM. Gélis and Conté, and M. Bouillaud's report, * have lately introduced into Therapeutics, begins to be called for in the shops. It is therefore important to give certain officinal formulæ, which may allow medical men to calculate the quantity of salt employed, under various pharmaceutical forms. The following are those proposed by M. Cap:

LOZENGES OF LACTATE OF IRON.

Lactate of iron . .	30gr.
Sugar	360gr.
Mucilage of gum arabic .	Q.S.

Make, secundum artem, lozenges of the weight of 65 centigrammes, which will each contain 5 centigrammes of the salt.

SYRUP OF LACTATE OF IRON.

Lactate of iron . .	4gr.
Boiling distilled water .	200gr.
White sugar . . .	400gr.

Lactate of iron being soluble only in 40 parts of boiling distilled water, a greater quantity could scarcely be introduced into a syrup. This proportion is a 150th (about 4 grains in the ounce). The process which M. Cap found most successful is the following:—

The salt is triturated in 4 times its weight of powdered sugar; it is quickly dissolved in the whole of the distilled water; it is poured into a matrass, which is placed in a

* See *The Chemist*, No. IV., p. 126.

sand-bath, after having added to it the remainder of the sugar, broken in small pieces: as soon as the sugar is dissolved, the syrup is filtered, and, when cold, is confined in well-corked bottles. This syrup has a slight amber tint, and keeps very well. I think its use more convenient than that of lozenges, because the ferruginous taste does not remain so long in the mouth.

PILLS OF LACTATE OF IRON.

Lactate of iron . .	} āā a gramme.
Marshmallow power .	}
Honey	Q. S.

Ft. 20 pills, which should be silvered immediately, or covered with gelatine prepared according to Mr. Garot's process.*

I give this formula, which, doubtless, may be modified in its proportions, merely to inform medical men that it would be improper to put, in contact with lactate of iron in a pilular mass, astringent extracts, or salts capable of decomposing it.

ON THE EFFECTS OF IODINE.†

BY DR. ASMUS.

However different may be the opinions concerning the effects of iodine, it seems at least to be ascertained that this remedy, which, in the state of spirituous solution, acts as a poison, and which physicians very rightly fear to make use of, is one of the most salutary and indispensable in medicine, when employed in the state of hydriodate or of iodic acid. Coindet made his first experiments by means of iodate of potassa, and Dumas foresaw, twenty years ago, the dangers which would arise from using the spirituous solution, preferring, in all cases, a hydriodate. The disastrous consequences which occurred when this great remedy was first employed, caused it to be confined to too few cases, until Lugol at length assigned it the rank it merits; *sed adhuc sub judice lis est*: even now, physicians are not unanimous as to the nature of the remedy in question.

While some, without any difficulty, recognise it as an antiphlogistic, others fear the heating action of the preparations of iodine, and the analogy supposed to exist between the effects of iodine, chlorine and bromine, is losing ground more and more. It may not, therefore, be uninteresting to communicate a few observations concerning the effects of iodine in diseases wherein the influences of which we speak would be presented accurately and powerfully, and wherein it would always and without restriction, injure or be useful. These influences are perceived in inflammatory diseases. I have had opportunities of trying this remedy in many persons affected with ptyalism, and of observing the salutary effects of iodine against this disgusting symptom. Moreover, I have already published the results of them. Although then, as now, that I have often employed iodine, I had not observed that it exercised a great influence over the vascular system, I nevertheless feared to employ it in true inflammations, until the following fact had rendered me more bold.

A servant was affected with a violent consumption; he had already been bled three times; powerful doses of stibial tartar had been administered, blisters were applied, and the disease did not diminish in intensity; the symptoms of suffocation also increased, whilst the pulse, becoming uniformly softer and smaller, made me hesitate to continue the bold use of this antiphlogistic treatment. Calomel in copious doses, according to Hamilton's method, produced some amelioration, when a violent ptyalism presented itself. The inflammatory symptoms again increased: the whole mouth was covered with mercurial ulcers, so that the patient could scarcely open it, and the breath had a fetid smell, when I prescribed hydriodate of potassa: I administered two drachms of it in four days, and consequently more than 80gr. of iodine. The immediate result of the first doses was amelioration of the odour exhaled from the mouth, and four days after, the ulcers, with the exception of one, were cicatrized: the salivation again became normal, and the inflammatory symptoms had disappeared, so that the patient, except great weakness, might be considered as re-established.

From this observation it may be concluded that the fear of employing iodine in inflammatory *habitus* has but little foundation, although it may be doubted whether it should ever be used in true inflammations.

I intend to publish the observations which I have already made, and those which I may make hereafter: I will here add only that iodine produced good effects in a woman aged fifty years, who was affected with catarrh of the lungs, accompanied with a copious expectoration, partly tuberculous and partly pituitous. At the expiration of a few days, the expectoration ceased, and the chest became more free; but the patient, satisfied with the relief which she experienced, desisted from using the remedy for the sake of economy.

* For a process of making capsules of gelatine, see *The Chemist*, No. IV., p. 126.

† *Caspar's Wochenschrift für die gesammte Heilkunde.*

In cases of periostosis, iodine ointment * exercises a solvent power; an effect which was still more remarkable in a case of tumor of the left sterno cleido-mastoidens of a married woman who was affected with syphilis. The dyscrasy was stopped probably by means of the cure of Berg, but the considerable tumour, which was as hard as a stone, resisted all remedies. Twenty-five grammes of this ointment reduced the circumference of the tumour almost to nothing, and most probably it is now entirely dissipated, for I have not seen the woman for some time.

I was less fortunate in employing this remedy in membraneous angina. Copper and calomel had not produced any effect: nor had bleeding caused any amelioration. The state of the patient had already become desperate when I determined on trying iodine. I placed compresses steeped in tincture of iodine on a sore which had previously been produced by a blister, and I administered internally iodine and hydriodate of potassa in large doses. But it was without any good effects; the rheum, after each dose, became, on the contrary, more frequent and more disquieting, and I was compelled, twelve hours after, to discontinue it.

ON THE ACTION OF DIURETIC MEDICINES.†

BY M. JULIA DE FONTENELLE.

At the sitting of the Academy of Sciences, on the 11th of May, M. Julia de Fontenelle made known the results of experiments by which he undertook to prove the action of diuretic medicines.

These experiments were made on three persons, and were pursued for eight months. M. J de F. kept an account, not only of the quantity of liquids taken as drink, at meal-time, or as vehicles for medicinal substances, but likewise of the quantity of water contained in the solid food. He kept account also of the atmospheric temperature, and of the frequency of pulse in each individual subjected to this experiment. From his investigations he concludes that most of the drinks considered diuretic are not more so than pure water; and that with respect to substances which really have an influence on the secretion of urine, there are some which, according to the doses in which they are administered, may produce exactly opposite effects.

* Iodine ointment may be prepared by rubbing together, so as to form an ointment, one scruple of iodine and one ounce of prepared lard. EDITORS.

† *Compte Rendu de l'Académie des Sciences.*

ON A SUBSTANCE EXTRACTED FROM THE BUDS OF THE LILAC.‡

BY E. WISLIN.

The March Number of the *Journal de Chimie Médicale* contains an article entitled: *New substitute for sulphate of quinine,*§ discovered by M. Rigatelli. The properties attributed to this febrifuge appearing to me to present a great analogy with a substance extracted from the buds of the lilac (syringa vulgaris), I take the liberty of addressing this to you, begging you to insert it in an early number of your journal.

In 1836 and 1837, seeking to isolate the active principle of lilac buds, I obtained only a complex extractiform matter, of an umber color, extremely bitter, retaining very tenaciously the herbaceous odour of the buds; soluble in water and in alcohol; insoluble in ether, anhydrous alcohol, &c.; Drs. Berthet and Ducroquet administered it with success in diseases where sulphate of quinine had failed.

Not wishing to continue my experiments without the participation of M. Cruveilhier, who first observed the febrifuge properties of the lilac, I wrote to him in October 1837: || he was kind enough to reply immediately, approving of my plan and promising me his co-operation in the clinical experiments which would be necessary. Shortly after this I showed this substance to M. Deleschamps, of Paris.

Various circumstances compelled me to interrupt this work, which I intend to resume this spring, when I shall be able to procure lilac buds: I will then hasten to acquaint you with the result.

ON THE SALE OF POISONS.

To the Editors of The Chemist.

GENTLEMEN,

It has often struck me that something ought to be done in reference to the sale of poisons; that there is too great a facility afforded to the public for procuring the same, will, I think, be generally admitted; in some instances, no doubt, too little care

‡ *Journal de Chimie Medicale*, May 1840.

§ For which see *The Chemist*, No. V., p. 157.

|| It was not my intention to speculate on the success of these trials. The following is a passage of my letter to M. Cruveilhier: —"I cannot conclude this letter, Sir, without assuring you that the authority of your name shall not, in this case, be used to encourage a commercial speculation, the experiments which I solicit having no other object than the interest of science."

and discrimination are exercised in the sale thereof, and on referring to the statistics of poisoning,* ample proof will be found that many deaths have occurred through culpable carelessness and ignorance, as well as from the design of the purchaser meditating self-destruction.

In the forthcoming measure of medical reform, I trust this important point will not be lost sight of, and that a remedy, as far as practicable, may be provided: in the mean time I would suggest that it would perhaps tend in some degree to avert the dreadful act of suicide if it were to become an established rule, that the party requiring poison, should on no account be supplied without being accompanied by a person to witness the transaction; this would exonerate the retailer of poisons from all blame, and I apprehend, when known, defeat the suicidal intentions of many.

I throw out this hint, hoping some of your numerous readers and contributors may be able to devise some better plan.

and remain,
Gentlemen,
Yours respectfully,
J. T.

June 13, 1840.

CALOMEL WITH IODINE AND SUGAR.

A combination of calomel with iodine and sugar is used in Riga in cases of hydrocephalus in children, with remarkable success. The following is the most common prescription, as given in Schmidt's Jahrbücher.

R.	Hydrarg. submur. .	gr. viij.
	Iodin.	gr. j.
	Sacchari albi . .	gr. lxxx.

M. Ft. pulv. divid. in xvi partes equales.

Powdered digitalis and *pulvis gummosus* are occasionally combined with it. If the calomel and iodine be first rubbed together and the sugar afterwards added, the powder becomes red; but if the calomel and sugar be first commixed and then the iodine added, it will be greenish; deutiodide of mercury being formed in the first case, and protiodide in the second. Most cures have been effected by the red powder.

According to theory, eight grains of calomel, combined with one grain of iodine, should yield

Protochloride of mercury (calomel)	6·124 gr.
Deutochloride of mercury (corrosive sublimate) . . .	1·078 gr.
Deutiodide of mercury . .	1·798 gr.

In the result of actual analysis, the only difference was, that a trace of protiodide of mercury was found in the powder, and consequently more corrosive sublimate than theory supposes.

As every powder is made, according to the above prescription, with half a grain of calomel and $\frac{1}{16}$ of a grain of iodine, it contains after manipulation:—

Corrosive sublimate, 0·067, or about $\frac{1}{16}$ of a grain.

Calomel . . 0·383, or about $\frac{3}{8}$ of a grain.

Red iodide of mercury, 0·112, or about $\frac{1}{9}$ of a grain.

GOUT PAPER.†

According to M. Berg, an apothecary at Stuttgart, English gout paper (*Charta antirheumatica*), may be prepared in the following manner:—

R.	Euphorbii . . .	℥ j.
	Cantharid. . . .	℥ ss.
	Alcoholis . . .	℥ v.

Digere per viij. dies, cola et filtra; tum adde

Colophonii albi . .	℥ ij.
Terebinth. Venet. .	℥ iss.

M. F. l. a. vemix.

Common writing paper is to be spread over three times with this varnish. Gout paper prepared in this manner adheres very firmly to the skin, and is not apt to shift from its place.

The following prescription for a *charta derivans* is given by M. Pirwitz, an apothecary at St. Petersburg.

R.	Cantharid. Pulv. . .	℥ ss.
	Resin. Guaiaci . .	℥ iij.
	Galbani . . .	℥ vj.
	Alcoholis . . .	℥ vj.

Digere l. a., tum cola et adde

Colophonii . . .	℥ iiss.
Terebinth. Larac. .	℥ j.

Salve l. a., ut f. vemix.

This varnish is to be gently heated in a water-bath, and then spread upon fine letter paper two or three times with a brush: care should be taken that each layer is dry before another is put on.

INCISIVE PECTORAL LOZENGES.‡

Dr. Grunn, of Photsburg, recommends the following formula in cases of chronic catarrh:—

R.	Powdered sugar .	500 grammes.
	Flake manna .	125
	"Thridace" . .	8
	Ipecacuanha in powder	18
	Squils in powder .	4

Mucilage of gum tragacanth, q. s.

Mix: make a homogeneous paste and

* See *The Chemist*, No. II. p. 51.

† *Schmidt's Jahrbücher.*

‡ *Journal de Chimie Médicale*, May 1840.

divide it into lozenges of 1 gramme. Five or six to be taken every day.

ON RE-VACCINATION.*

At the sitting of the Academy of Medicine, held on the 28th of April, M. Sédillot read part of a long Memoir on re-vaccination. The object of this work was to shew the indefinitely preservative power of vaccine, from the variolic virus, whether spontaneous or proceeding from vaccination: If, said this physician, new doctrines seem to shake this old opinion of eminent men, which is based on so great a number of facts, it is because diseases very different from variolas have been confounded with this scourge which was so terrible before the time of Jenner. The author, in order to avoid falling into a similar error, establishes, 1st, The characters and nature of natural or inocculated variola: 2nd, Of the bastard variola, varioloïd, &c., of authors; 3rd, Of the spontaneous cow-pox of the cow, communicated from that animal to man; 4th, Of vaccine from man to man, and from man to the cow.

As regards the determination of the characters and nature of variola, it must be known that neither the umbilical form of the pustules, nor the peculiar appearance of the cicatrices, nor the violet redness of the skin at their base, are sufficient to indicate this affection; it is on its progress and on the regular developement of its five periods and of the symptoms peculiar to each, that we must depend. In spontaneous variola, the period of incubation is wanting; in the period of invasion the disease has already become general, and the organization totally disturbed; the air surrounding the patient has already become infected, and the practised physician may detect the peculiar smell attending variola. This very characteristic odour may remain even in the absence of the eruption or the third period, which may be wanting, from what is called by the greatest physicians, *variola sine variolis*. At maturity, the odour is more appreciable; change of character, and other symptoms supervene; intumescence of the skin and areola of the pustules. The odour remains during the period of desiccation, when all the other symptoms subside, and crusts and scales appear.

Every eruption which does not present *all* the preceding characters is not variola.

In the author's opinion, vaccine does not lose its power after a certain number of transmissions.

At the sitting of the 5th of May, M. Sédillot read the second part of his Memoir, in which he comes to the following conclusions:—

1st, That variola has an absolute, unlimited preservative virtue.

2nd, That cow-pox in its transmission from the cow to man assumes the characters of the vaccine virus.

3rd, That the latter by its transmission, however indefinite, loses none of its properties.

4th, That revaccination is inconsiderate and even blameable on account of the fears and doubts which it awakens.

* *Gazette Médicale de Paris*, Nos. 18 and 19.

ON LAUREL WATER.*

BY M. PATON.

This water occupies a conspicuous place among those medicines whose action is uncertain. One medical man, for example, has administered twelve ounces of it in twenty-four hours without inconvenience, whilst another considers it poisonous in the dose of a few drachms. Hence it is impossible to employ this medicine with security, although in some cases it appears to be possessed of very active properties: hence also the necessity of examining the various modes of preparing this distilled water. M. Paton's investigations, the principal results of which, divested as much as possible of the technicalities into which the author is unavoidably led by the very nature of his subject, are as follows:—

M. P. first notices, as having contributed to give credit to the variation in the energy of the "hydrolate" of cherry laurel, the difference in its preparation, which, when it was first employed, was made with two pounds of leaves to one pound of "hydrolate," whilst now two pounds are procured from it. The nature of the soil on which the laurel leaves destined for its preparation are found, and their exposure to a hot sun, have great influence on the activity of the preparation; but it is impossible to define it in an accurate manner.

Being desirous of ascertaining whether the different periods of vegetation had a direct influence on the quantity of hydrocyanic acid contained in this water, and to which it owes all its activity, M. Paton distilled leaves taken at different times from the same plants: he commenced on the 15th of June, and concluded on the 30th of August. The proportions of hydrocyanic acid did not vary very considerably: however, he found the greatest quantity in it towards the end of July.

* *Journal de Chimie Médicale*, April 1840.

Afterwards, wishing to ascertain how much acid was contained in some laurel water which he had prepared in 1838, he treated it by an excess of nitrate of silver, and obtained from 500 grammes of laurel water a quantity of cyanide of silver representing 8 decigrammes of anhydrous hydrocyanic acid, or 5 centigrammes, one grain, in the ounce.

Of all modes of preparation, that on the open fire appears to the author most advantageous: he rejects, above all, the mode of preparing it by steam, by which he has been able to procure only very inferior products.

M. Paton rejects as false the very commonly received opinion that cherry laurel water undergoes alteration very speedily. Water which had been prepared two years before, yielded nearly the same quantity of hydrocyanic acid as when it was first prepared. It may easily be preserved when well corked, and in vessels, as much as possible, always kept full. This may easily be done by putting it in small bottles.

One of the most frequent causes of the uncertain action of this water, is the dishonesty of those who supply it. Frequently, when hydrocyanic acid has been sought in it, a few traces only have been found.

One of the chief characteristics of a good medicine being to present an uniform composition, laurel water cannot really be designated as such. But is it necessary, as has been proposed, to substitute different mixtures for it? M. Paton is opposed to this: he says it would be depriving Materia Medica of a medicine whose properties are often advantageous; and he proposes, in order to obviate the above mentioned inconveniences, to give it a specific degree of value by which it may easily be appreciated.

He recommends that the laurel leaves be distilled at a stated period, in the month of July, for example: then, that the value of the product be determined by means of nitrate of silver; then, for a second, by pure potassa or soda, nitrate of silver and nitric acid, and the quantity of cyanide obtained will indicate the quantity of hydrocyanic acid; and the physician, knowing exactly the strength of the medicine which he prescribes, will no longer dread the employment of an inert medicine: still less will he have to fear the poisonous effects which have so frequently been observed after the administration of laurel water.

SOLUTION OF BI-CHLORIDE OF MERCURY, IN ITCH.*

In a discussion which arose at the *Société de Médicine* of Paris, on the treatment of scald head, M. Prus called attention to a means which he has often found successful in the treatment of prurigo, a disease frequently very obstinate among the old people whom M. P. attends at Bicêtre. This means consists in the application, morning and evening, of lotions of a gramme of bichloride of mercury in a pint of water, to all the parts where the prurignious papulæ exist.

EMPLOYMENT OF CARBONATE OF AMMONIA IN SCARLATINA.†

BY DR. BODENIUS.

English and American physicians have published very curious results concerning the efficacy of carbonate of ammonia in scarlatina. Dr. Bodenius wished to confirm by his own experience the praises bestowed on this medicine, with which he has obtained so much success in a raging epidemic, that he gives as much importance to it, in this kind of affection, as to vaccine for preserving from variola.

His formula and mode of administration are as follows:—

Carbonate of ammonia .	gram 2 to	4·00
Distilled water . .	,,	90·00
Syrup of marshmallow .	,,	32·00

A coffee-spoonful every one or two hours.

It must be added, in order to avoid all mistake, that Dr. B. did not confine his treatment to this only. When the fever was very violent, and accompanied with cerebral symptoms, he administered glysters of very concentrated bran water, with two or three spoonfuls of strong vinegar. When the eruption appeared, he left off these and administered carbonate of ammonia. From the ninth day he ordered a bath every day. After the twentieth day, he allowed the children to take the air.

AMMONIA IN DRUNKENNESS.‡

The property possessed by ammonia of causing the symptoms of drunkenness to disappear, is not yet sufficiently established: it is useful, therefore, to collect all facts which tend to elucidate this subject.

At a meeting of the *Société de Medicine* of Paris, M. Nonat related the history of two cases of drunkenness, successfully treated by ammonia in a draught and in

* *Bulletin de Therapeutique.*
† *Medicinaische Annalen.*
‡ *Bulletin de Therapeutique.*

glysters. One of the two patients had been bled, and an emetic had been administered to him: his condition was one of the most serious. Sixty drops of ammonia in two draughts cured him. M. N. saw, at the Hotel Dieu, in the service of M. Caillard, a man who had drunk three pints of brandy; he appeared to be at the point of death. He was made to breathe ammonia, and a glyster of it was administered to him, for he was unable to drink. Numerous evacuations took place and the patient recovered.

On this occasion, M. Prus mentioned a case which he had himself observed. A man of sixty years of age was brought to the infirmary of Bicêtre, dead-drunk. M. Prus saw him at nine o'clock in the morning: he prescribed 4 grammes of acetate of ammonia in a glass of water: before ten o'clock had struck, the patient had returned to his usual state.

ON THE EMPLOYMENT OF TORMENTILLA IN MEDICINE.*

BY M. MORIN.

The tormentilla, *potentila erecta, tormentilla erecta*, Linn., which according to Meissner, is composed:—

Of myricine	2
Of cerine	5½
Of resin	4¼
Of tannin	174
Of tormentilla red	180¼
Of modified red	23½
Of gummy extract	43¼
Of gum	282
Of extractive matter	77
Of ligneous fibre	143
Of water	64

And of traces of volatile oil,

has been employed in medicine as an astringent. It has been recommended in dysenteria, hemorrhagia, and in all cases where astringents are used: it has just been recommended in the treatment of panaris.

The following observations on the employment of this root is due to M. Morin:—

A servant was attacked with an exceedingly painful panaris: she used this substance, the application of which to the diseased part caused the violent pain which she experienced, to subside: the skin which was smooth, red and tense, changed its state, the swelling was dissipated and the patient recovered rapidly.

In another subject, the panaris was more serious, and was further advanced in progress: the skin was ulcerated at the extremity; a small flaky fleshy part contracted in the sore, was raised above the finger.

An incision in the contraction became necessary, but all the symptoms ceased on the application of tormentilla, and the instrument was not used; the panaris was cured in a few days. By the application of this plant the symptoms disappeared, one after another; the pain was stopped in a manner which was as quick as surprising.

The exhibition of tormentilla in another case of panaris was attended with similar results.

According to M. Morin, the efficacy of this substance, in panaris, is such as entirely to do away with the use of the bistoury in individuals affected with this complaint.

The following is the method of using this plant:—

The tormentilla root is dried by the fire; it is pulverized, and made into a paste with white of egg; this paste is thinly spread on a piece of linen, and the diseased part is wrapped in it: it is necessary to place an emollient cataplasm over the linen to prevent the paste from drying.

* *Journal de Chimie Médicale*, May, 1840.

ADULTERATION OF CERATE.

Dr. Faucher informs us, 1st, that the cerate sold by druggists is prepared with inferior oils, often of bad quality, and with impure wax; 2nd, that this cerate may be bleached with sub-carbonate of potassa; and 3rd, that, when applied to sores, burns, &c., it often increases inflammation.

To ascertain the bad quality of cerate he points out the following process: a given quantity of cerate is boiled in a sufficient quantity of river water, or better still with rain water (as more pure). Fresh water is added in proportion as it evaporates: after long boiling it is allowed to cool, and is then decanted or filtered; after which operation, it is found that the cerate has lost weight, because the soap is dissolved in the water as well as the carbonate of potassa which is in excess.

Pure cerate, treated in the same manner, will not lose weight. There exist other scientific means of detecting the adulterations of cerate.

ADULTERATION OF MILK.

The authorities of Rheims and Réthel have adopted the plan of weighing milk in order to detect the frauds practised by milk venders, and to punish those guilty of them. This has produced the best results, and the inhabitants have now the advantage of drinking none but pure milk.

EFFECTS OF EXTRACT OF STRAMONIUM IN FACIAL NEURALGY.*

BY DR. WOLFFSHEIM.

In support of the observations recently published by Dr. Droste, the author of this article mentions two cases of facial neuralgy of the right side, which were successfully treated by extract of stramonium.

The subjects were two women: one aged fifty years, married, and without children, in whom menstruation had ceased for more than twenty years; the second, between thirty and forty years of age, of a pale, cachectic complexion, regular in menstruation, and the mother of two children. Both led a very retired and sedentary life, and had long suffered from facial neuralgy.

In both cases, after having tried other remedies to no purpose, Dr. Wolffsheim employed the extract of stramonium according to Dr. Wendelstadt's recipe, and, except a little clogging of the tongue in one of the patients, no narcotic symptom manifested itself. The pain was dissipated from the fourth day.

With one of the patients there was, a few days after, a relapse, which yielded to the same treatment.

Dr. Wolffsheim does not agree with Dr. Droste, who considers that the right side of the face is less subject to neuralogy, than the left, because it is stronger.

EMPLOYMENT OF THE VAPOUR OF ALCOHOL AGAINST THE INSPIRATION OF CHLORINE.

In large bleaching establishments, in the manufacture of chemical products, and in the experiments of the laboratory, it frequently happens that the inspiration of chlorine gas produces very dangerous effects. This danger may be avoided, by breathing the vapour of alcohol, or by swallowing pieces of sugar steeped in spirit of wine.

This remedy had been used for some years with the most beneficial results.

INTRODUCTION OF SULPHATE OF COPPER AND SULPHATE OF ZINC INTO BREAD.

In the *Petites Affiches de Courtray*, for the 12th of February, we read that the authorities of that town, having been informed that poisonous substances were mixed with articles of food, ordered the commissary of police to repair to the houses of several bakers, and, if required, to seize the substances put into bread. In the course of these investigations, four bottles containing sulphate of copper (blue vitriol), sulphate of zinc, &c., were found at the house of a baker. His bread, and other merchandize seized, will be submitted to chemical analysis.

This is not the first time that alarm has been given to the public concerning the employment of ingredients prejudicial to health in the making of bread: but the result of the inquiries has generally been unsatisfactory. This may easily be conceived, and it cannot possibly be otherwise: a physician, either in the exercise of his profession, or by chance, discovers sulphate of copper in bread; he sends information of this fact to a journal, which, doubtless with a good intention, publishes the fact; the physician and the detainer of the bread, being called upon by the authorities, do not wish to be made informers, and refuse to give up the baker, who, in the meanwhile, removes every thing calculated to compromise him, and justice is thus defeated.

EXHIBITION OF SMALL DOSES OF SULPHATE OF COPPER IN HOOPING-COUGH.

In a letter addressed to the Editor of the Lancet, Mr. P. C. Chavasse, author of "Advice to Mothers on the Management of their Offspring," calls the attention of the medical profession to the great value of small doses of copper, in hooping-cough. He has used it in a great number of cases, and with the most beneficial effects.

The form which he generally orders is as follows:—

Sulphate of copper, ½ gr.;
Syrup of poppies, ℥ss;
Aniseed water, ℥iss; M.

One or two teaspoons (according to the age of the child), to be taken every four hours.

NEW MODE OF DETECTING THE ADULTERATION OF FLOUR.

BY M. SELLIER.

The following, which has already appeared in several daily papers, we are nevertheless induced to present to our readers, considering that its importance will be a sufficient apology for our so doing:—

"An ingenious and scientific gentleman in Paris, M. Sellier, who, it may be recollected, some time ago pointed out the intimate connection existing between sound and electricity, having had his attention called to the subject of the adulteration of flour by its admixture with the fecula of potatoes,

* *Hufeland's Journal.*

has been so fortunate, in some recent experiments, to hit on a means which, with very little practice, may be made use of by any one for the purpose of detecting the presence of fecula in flour, and showing the actual extent to which the fraud has been carried. M. Sellier's process is as follows: he takes a plateau or board of a flat surface, over which a coating of common sealing-wax has been laid, and charging part of the surface with positive and part with negative electricity, by means of a Leyden jar, he throws on it, through a barber's puff or small bellows, a quantity of flour, when, if the article be mixed or adulterated even to a fifteenth part, the flour is completely detached from the extraneous matter, and attracted by the negative electricity, and the fecula by the positive. The appearance described on the waxed board by the fecula is what is known to men of science as Lichtenberg's figures. The difference between flour and fecula is so great, when examined through a microscope or magnifying glass, the flour retaining its dead opaque white appearance, while the fecula exhibits a variety of transparent particles, that the most unpractised eye needs but a short time to distinguish the one from the other."

NEW AND SUCCESSFUL MODE OF TREATING HYDROPHOBIA, OR CANINE MADNESS.

The following communication to the Editor of *The Times* is of such vast importance that we think it our duty to present it, unabbreviated, to our readers.

To the Editor of the Times.

Sir,—For the following official document, published by command of the Austrian War Department, I am indebted to my superiors at His Imperial Majesty's Embassy in London. I think that at a season when that dreadful, and hitherto irremediable malady, "hydrophobia," is most prevalent, it is a duty to make public its supposed remedy; such being, besides, the philanthropic object of its official promulgators, who have written the original account in a manner to be generally intelligible.

On perusing the document the remedy would not appear, *a priori*, to a medical eye, a powerful antidote; but opinions are nothing in presence of facts, and these facts, I am informed, are briefly the following:—

"A schoolmaster, named Lalie, residing on that boundary of Hungary towards Turkey where the military colonies are located, having the established reputation of possessing a cure for hydrophobia, the Minister of War, to whose department the government of this territory belongs, instituted an inquiry. Two hydrophobic patients were placed under the care of the military medical officers until they despaired of them; they were then intrusted to the care of the schoolmaster, and were cured.

"A liberal remuneration being given to this person, he is to receive adequate rewards if, after two years' exercise of his remedy under medical surveillance, his discovery is proved to be of sterling value.

"The root of which M. Lalie has recognized the efficacy is the *gentiana cruciata*. It is an abundant natural product.

"TREATMENT IN THE EARLIEST STAGE OF THE DISEASE.

"When the first symptoms appear the mouth must be examined, and beneath the tongue the venæ raninæ or sublingual veins will be found turgescent. This turgescence is at first confined to the neighbourhood of the frænum, and it appears under the form of black spots, resembling the heads of flies; but later, the disease having developed itself, the swelling affects the whole veins. The following is the treatment to be adopted at this period:—The tongue to be grasped with a wooden fork and inverted, and the sublingual veins to be opened with a lancet. The tongue being then liberated, the bleeding must be allowed to continue until it ceases of itself. Then is to be given the first dose of the remedy:—

"Three quarters of an ounce (1½ *loth*) of the gentiana cruciata are to be given as a *maximum* dose; the root being first pounded, and then macerated in water, so as to form a thin paste; this must be repeated every morning for nine days. At the same time the wound is to be treated in the following way: when fresh it is to be washed with spirit of rosemary, and then a poultice is to be applied, composed of two portions of rye-flour and one of juniper berries, mixed with the strongest spirit of wine, to form into a paste. If the wound is closed, it must be opened and scarified.

"TREATMENT IN ADVANCED STAGES OF THE DISEASE.

"When the disease has already reached its most violent paroxysms, the patient being properly secured, one ounce of the root is to be administered, and to do this a strait jacket being put on the patient, two strong men must be employed to overcome his resistance; his mouth must be opened with two wooden wedges, the nasal air passage being hermetically closed until he has swallowed.

"If after three hours the patient's paroxysms continue to recur, an entire root must be introduced into the mouth, and there

secured until bitten away and dissolved. The sublingual veins are to be opened at the first lucid interval, and after the bleeding a little broth may be administered. After this, the patients in general take water without opposition, and fall into a gentle slumber for eight or ten hours, and are cured. During sleep mucus is secreted in the mouth, of the consistency of the white of an egg, of a slightly yellow colour; it is very adhesive, and is with difficulty ejected. It is important the patients should be made to throw up this phlegm. This secretion characterizes the first three days of the malady, and great care must be taken to remove it, principally before the remedy is administered.

"When the bleeding has not been sufficient, it may be resorted to again after five days, in violent attacks, and the decoction given when slight relapse has shown itself after nine days; and an aperient after three days' interval is to be resorted to."

The above is a greatly abridged transcript of a very circumstantial document. I must repeat, however incompetent the remedial resources may appear, they may prove effective. The most powerful remedies have not been discovered by *savans*, and the most valuable of our specifics is due to an Indian, who in a paroxysm of ague chanced to slake his thirst in a stagnant pool, in which lay the branches of the cinchona tree, another bitter, though differing so much from the gentians.

I remain, Sir,
Your obedient servant,
HENRY BELINAYE.

41, King-street, Argyll-place, June, 1840.

[It need scarcely be remarked that the treatment here recommended requires much experience before it can be relied on as a remedy for this hitherto hopeless malady. Opportunities, however, by which the efficacy of this plan may be tried, it is much to be feared, will not long be wanting, at this season of the year; for the shameful manner in which dogs, often of the most worthless description, are at all times suffered to run about the streets of the metropolis is truly frightful.]

To the Editors of the Chemist.

GENTLEMEN,—I shall feel particularly obliged if any of your correspondents will inform me what composition it is, which, when applied to brass, will almost instantly give it the appearance of bronze.

I have a small quantity of an article called by the maker Chemical Bronze; it is of the colour of white wine, has no peculiar taste or smell, and affords no precipitate with ammonia.

I shall also feel obliged by any of your correspondents informing me how to produce acetate of tin.

I remain, Gentlemen,
Your obedient servant.
A SUBSCRIBER.

Limehouse, June 7, 1840.

TO CORRESPONDENTS.

NOTA BENE.—*All Communications must be addressed, "To the Editors of the Chemist, care of Mr. Hastings, Publisher, 13, Carey-street, Lincoln's Inn Fields, London." Communications must be post-paid, and sent before the 15th of each month.*

R. W. Worksop, Nottinghamshire.—All replies to the question of our correspondent must be regarded for the most part as speculative; for there are no means of ascertaining the changes which take place under such circumstances. We have here two organic bodies acting on each other. Still there can be no doubt that alcohol undergoes decomposition, to a certain extent, especially when we consider that the stomach generally contains animal and vegetable matters, and that alcohol is converted partly into acetic acid and other compounds, as we have frequently found in persons of weak digestion. To trace all the changes which it may undergo in a living animal body, would be an utterly hopeless task.

That part of the alcohol is absorbed into the system, is well known: the blood of persons bled during intoxication (mistaken for apoplexy) frequently gives a strong odour of ardent spirit; it has also been perceived in the brain of persons, whose skulls have been fractured while under the powerful influence of spirituous liquor.

P. H. H.—We shall comply with the request of our correspondent, at our earliest convenience.

We are obliged to A. P. for his valuable suggestion, which shall receive every consideration.

We are not in possession of the information required by Mr. Smith.

"SCHEELE" will be attended to in our next.

STEWART AND MURRAY, PRINTERS, OLD BAILEY.

THE CHEMIST.

I. CHEMISTRY.

ON THE COMPOSITION OF BILE.*

BY M. BERZELIUS.

I. ANALYSIS OF BILE BY SULPHURIC ACID.

Ox bile is evaporated in a sand-bath, or *in vacuo*, over sulphuric acid, by raising the temperature to + 100° or + 110°, so that the mass may become sufficiently dry to be reduced to powder. Anhydrous ether is then added. This removes all the unsaponified fatty bodies. After being two or three times digested with ether, the powder is dissolved in anhydrous alcohol, which leaves a residue consisting of mucus, of muriate of soda, and of other salts and animal matters insoluble in alcohol, and dissolves, on the contrary, a combination of the bitter principle of bile with alkali, margarate and oleate of soda, the coloring matter of bile engaged in a similar combination, &c. The solution thus obtained is filtered, and the undissolved portion is washed first with anhydrous alcohol, which is afterwards added to the filtered liquor, afterwards with alcohol of 0·85, which dissolves certain substances, and which is laid aside. The solution in anhydrous alcohol is then mixed by small portions, and by stirring, with an aqueous solution of chloride of barium, until a deep green precipitate ceases to be formed: this precipitate is isolated by the filter, and washed with alcohol, which, however, need not be anhydrous. Baryta-water is afterwards added, by drops, to the filtered liquor: the precipitate which is then formed is at first of a deep grey, but it soon acquires a green color: the baryta-water is added until the liquor is no longer rendered turbid by it: the precipitate soon loses its green color; but it becomes brownish yellow, and, at last, yellowish only. It is isolated by the filter, and washed with alcohol of 0·84.

The first precipitate, formed by the chloride of barium, contains the substance which gives bile its green color, combined with baryta: M. Berzelius calls this substance *biliverdine* (from *bilis*, bile, and *verdir*, to become green.) The second precipitate, or that yielded by baryta-water, contains, besides biliverdine, a dark yellow colouring matter, which he calls *bilifulvine*, (from *bilis*, bile, and *fulvus*, dark yellow,) an extractiform matter and a peculiar azotous animal matter.

The alcoholic solutions contains uncombined baryta, which is precipitated by carbonic acid gas: the liquor is filtered and evaporated to dryness. The evaporation is completed *in vacuo*, so that the mass may be dried sufficiently to become hard and brittle. It is then redissolved in anhydrous alcohol, which leaves a residue of chloride of sodium of recent formation, and of chloride of barium. The solution is filtered, and mixed with sulphuric acid previously diluted with half its weight of water, and afterwards with alcohol. The acid is added by degrees, until it ceases to precipitate the bases (soda, baryta, and ammonia) which are in solution in the liquor in the state of sulphates. When, at the end of two hours, the addition of a few drops of acid does not produce any more turbidness in the clarified liquor, or deposit in the vessel, it is separated by filtration from the saline precipitate; the latter is washed with anhydrous alcohol, the filtered liquor is put into a retort with recently precipitated carbonate of lead, which has been well washed and is still wet, and it is distilled in a tubulated retort. The carbonate of lead combines with the sulphuric acid, and partly with the fatty acid. When nearly all the alcohol is driven off, the distillation

* *Annalen der Chemie und Pharmacie*, vol. xxxiii. p. 139.

is interrupted: the pale yellow liquor is separated by filtration from the precipitate of lead. It then contains oxide of lead, which may be precipitated by sulphuretted hydrogen: the sulphuret of lead thus precipitated is separated by filtration and washed with alcohol; the liquor is afterwards evaporated to dryness in a sand-bath.

We then have a yellowish, transparent, brittle mass, in the dry state, which, heated *in vacuo* to a temperature of from + 100° to + 110°, loses the remainder of its water, swelling up and leaving a white turgid mass: the latter is quickly pulverised, and treated by a little anhydrous ether, which is poured on it by degrees, and which is decanted off after having acted for some time; the ether dissolves the uncombined fatty acids, and a small quantity of a principle which will be spoken of farther on. The powder remaining is disembarrassed *in vacuo*, over sulphuric acid, from the ether which it still retains, and in this state it represents the bitter electro-negative principle of bile, as pure as it can be obtained.

This body, which M. Berzelius calls biline, (from *bilis*, bile,) possesses the following properties:—It is under the form of a soft transparent mass, of a light yellow, or colorless, inodorous, and of a less bitter taste at the tip of the tongue than at the root of that organ or the pharynx, and which, in that respect, resembles the bitter taste of the *abrus precatorius*. At the same time, the taste is rather sweet. Heated to a temperature somewhat exceeding + 100° C., it becomes slightly turgid, without undergoing any alteration; heated to a higher degree, it turns brown, swells up, becomes semifluid, inflames and burns with a resinoid, fuliginous flame: there remains a bulky carbon, which burns without residue. By dry distillation it gives ammoniacal products. It is soluble in water and in alcohol in all proportions, and insoluble in ether, which precipitates it from its alcoholic solution, under the form of a magma. It is identical with the biliary sugar of Gmelin, but it exhibits no crystalline texture, a circumstance which, in Gmelin's experiments, depended on a mixture of acetate of soda.

Biline has so great a tendency to undergo alterations, and to form an acid body, that even that which remains after the evaporation of the alcohol *in vacuo*, exerts an acid reaction on turnsole paper, and that its aqueous solution gives, with subacetate of lead, or with a little uncombined oxide of lead, a small quantity of an emplastic mass; this combination occurs more especially when the liquor is evaporated in the sand-bath.

Its aqueous solution is not precipitated either by acids, not even by tannic acid, nor by chlorine gas, nor by the alkaline, earthy, or metallic salts: but if much hydrated or carbonated alkali be mixed with it, there is separated a semifluid combination of alkali and biline, which is insoluble in the alkaline liquor, but which immediately dissolves in anhydrous alcohol: whence it results that biline has, in general, an affinity for bases and the oxides, but that the solubility of the combinations in water causes reactions to be wanting.

The tendency of biline to undergo alteration is singularly increased in activity by acids, aided by heat. The mineral acids have much more power in this respect than the vegetable ones; they decompose it so completely, that nothing more of it remains. With the latter, the alteration is incomplete, but much more advanced, however, than that produced by only water and heat. The mineral acids precipitate from it great part of the products of the change which it undergoes; the vegetable acids hold them in solution, or, at least, do not in any way impede their solubility in the liquor. In this change biline is decomposed into several products. These are, *ammonia*, *taurine*, *fellic acid*, (from *fel*, bile,) *cholinic acid*, (from χολη, bile,) and *dyslysine*, (from δυς, difficult, and λυσις, solution.) We need not follow M. Berzelius through all the details of the preparation of these products: we will confine ourselves to pointing out their principal properties:—

Taurine is white, in small crystals, and soluble in water.

Dyslysine is a resinoid body, very little soluble in boiling alcohol, even when the latter is quite anhydrous.

Fellic acid is white and inodorous, and has a bitter taste; it melts, at above + 100° C., into a transparent mass, which allows much water to be disengaged, and becomes hard after cooling. Heated more powerfully, it swells up, inflames, and burns like a resin, leaving a bulky carbon, which consumes without residue. Submitted to boiling with water, it fuses into a white transparent mass, and dissolves in a certain quantity of water, which, after evaporation, leaves it under the form of transparent drops in the vessel. The aqueous solution reddens turnsole paper, and has a slightly bitter taste. It is very soluble in alcohol even when diluted; the solution reddens turnsole paper, and has the characteristic bitter taste of bile. It is more soluble in ether than in water, but less than in alcohol. With the alkalies it forms salts, which are soluble in water and in alcohol, but insoluble in ether, and which are completely precipitated by an excess of carbonated or caustic alkali: the precipitate is emplastic. These salts have the bitter taste of bile, without any sweet taste. Chloride of barium forms an

emplastic precipitate in the aqueous solution of the alkaline fellates.

Cholinic acid is easily fusible, insoluble in water, very soluble in alcohol, and, to a certain degree, soluble in ether. The alkaline carbonates form with it combinations of an appearance similar to that of swelled up gelatine, very little soluble in water, but very soluble in alcohol. It does not readily combine with the caustic alkalies except in its alcoholic solution: the combination is then soluble in alcohol and in water. The salt of baryta forms in the alcoholic solution of the alkaline cholinates, a precipitate which is not emplastic.

Biline combines in two proportions with fellic acid, and perhaps also with cholinic acid: M. Berzelius calls the completely saturated combination, bilifellic acid.

But are these acids really contained in bile? or, indeed, are they products of the analytic treatment? The analysis of the salts of lead will furnish an answer to these questions.

II. ANALYSIS OF BILE BY THE SALTS OF LEAD.

From this analysis M. Berzelius draws the conclusions that bile really contains fellic and cholinic acids, and that the alteration of biline has begun in the body; but it appears to have followed an unequal progression owing to circumstances and conditions also unequal: it may be altogether wanting in certain cases, and, in others, it may be far advanced before the extraction of the bile. We have not therefore any reason to presume that in bile, biline bears a necessary and determined chemical relation to the fellic and cholinic acids.

ACTION OF ACIDS ON BILE.

We have seen that all the acids precipitate mucus from bile: after its separation we may add to recent bile as much sulphuric or hydrochloric acid as we like, without precipitating anything from it. If sulphuric acid, diluted with five or six times its weight of water, be added to the alcoholic extract of bile, it completely dissolves it, and the liquor is not turbid even at the expiration of 48 hours; it may be diluted with any quantity of water without becoming turbid; but if it be submitted to digestion, it very soon begins to deposit at the bottom of the vessel a thick, greenish liquid, which at first has a syrupy consistence, but which always becomes more fluid by prolonging the digestion. When the liquor is left to cool, after a couple of hours, a fatty mass, fluid when heated, floats on the surface, and may be removed; it is a compound of fatty acids, fatty matters, and cholesterine.

The deposit formed at the bottom of the vessel is bilifellic acid; at the same time, it contains a chemical combination of sulphuric acid with biline; it is M. Demarçay's choléic acid: if the digestion be continued, the biline of the two combinations is decomposed, and in the end there remains nothing but two resinous acids.

ALTERATION OF BILE BY BOILING WITH ALKALIES.

M. Berzelius boiled for some hours an aqueous solution of the alcoholic extract, with a solution of carbonate of potassa: he now and then diluted the mixture with a little water, whenever it commenced to deposit the combination of biline with potassa; he afterwards concentrated it sufficiently to effect the deposition of this combination. The colourless alkaline solution was then decanted, and the combination of biline and potassa dissolved in water and precipitated by acetic acid. Thus he obtained a white, light, crystalline precipitate, which he collected on a filter, washed with water, and dried. It was presented under the form of a shining mass, formed of an agglomeration of fine crystals, which quite agreed with the description of cholic acid given by Gmelin.

ALTERATION OF BILE BY LONG KEEPING.

Bile has a great tendency to putrify: this is owing to the mucus which it contains, and which seems to determine its alterations by a catalytic power, since they do not occur after the separation of the mucus. The products which are formed therefore have again to be examined.

A medicine, known by the name of *thickened ox-gall*, is prepared by evaporating ox gall in the sand-bath. It is frequently a year before it is used, and during that time it undergoes a slow change, which seems different from that produced by the acids. M. Berzelius examined some of this bile which had been kept for eight months.

It was semifluid, resembling a thick brownish green syrup, of a disagreeable, but not exactly putrid odour; it disengaged white vapors on the approach of a glass rod dipped in nitric acid. It was thoroughly dried in the sand-bath, treated by ether to remove the fatty matters, and afterwards dissolved in alcohol. This solution was treated by chloride of barium and afterwards by baryta water, in the manner above indicated. They separated the coloring matters and left a pale yellow solution, from which the alcohol was driven off by distillation. The alcoholic extract was dissolved in water and precipitated by acetic acid, which gave an abundant emplastic mass. The liquor precipitated by acetic acid left also, by evaporation to dryness, a portion of biline,

which bore very small proportion to the quantity of bile employed. M. Berzelius found in the emplastic mass two new acids, one which he calls *cholanic acid*, and another which he designates by the name of *fellanic acid*.

CHOLANIC ACID.

After desiccation it is white, earthy, inodorous, and insipid; it melts only at a temperature much above 100° C., and then disengages a small quantity of water. It becomes a transparent colorless mass, burns like a resin, and passes over by dry distillation under the form of a thick oil with an empyreumatic odour, leaving a little carbon in the retort. The distilled oil reddened turnsole paper. When boiled with water this acid melts, and is soluble only in a very slight degree. The water is rendered slightly turbid by cooling, and cannot be clarified: it exerts a scarcely perceptible action on turnsole paper. Alcohol dissolves it with difficulty when cold, but easily with heat, and by cooling some crystalline portions are deposited. When left to spontaneous evaporation, however slow, cholanic acid is deposited under the form of a colorless, transparent, resinoid body. It is but little soluble in ether. It deposits under an earthy form from the ethereal solution evaporated in the open air, but if the vessel be covered with a bit of glass, and the evaporation very slowly carried on, it remains under the form of crystals.

It is a very weak acid; but it drives off carbonic acid from the alkaline carbonates, and is dissolved. Its combinations with the alkalies have a bitter taste; after evaporation they are colorless, resembling gum, and easily soluble in alcohol and in water. The alkaline carbonates added in sufficient quantity to their solution, completely precipitate them. The ammoniacal salt is decomposed by boiling with water, so that the acids precipitate nothing from the filtered liquor. The barytic salt is earthy, insoluble in water, and but little soluble in alcohol of 0·84.

Cholanic acid, boiled for a long time with an excess of caustic potassa, does not undergo any alteration; but if it be boiled with hydro-chloric acid, without appearing to be in the least changed, it gives a body which is different with respect to its properties, which does not any longer combine with the alkalies, and which dissolves, only in very small quantity, in boiling alcohol: this solution does not become turbid by cooling, but leaves, by spontaneous evaporation, a white earthy body, similar to that which remains after the spontaneous evaporation of a solution of dyalysine.

FELLANIC ACID.

Precipitated by the acids from its saline solutions it forms white unagglomerated flakes, which melt by heat into a colorless liquid, which solidifies and becomes semi-transparent by cooling. After desiccation the precipitate forms a white earthy mass. This acid is inodorous and insipid: by dry distillation it passes over under the form of an unsolidifiable oil, and leaves a light transparent layer of carbon in the retort. It is very little soluble in cold, but more so in boiling water; in the latter, by cooling, a very distinct white cloud is formed, and, at the end of a few days it allows a very dense white precipitate to deposit, without becoming perfectly clear. It readily dissolves in alcohol, from which it is deposited in crystals by very slow evaporation. It dissolves only in very small quantity in ether, and is deposited from it in groups of soft needles, when the solution is left to very slow evaporation, as, for example, in a deep vessel covered with a piece of glass. All its solutions in these solvents redden turnsole paper. With bases it forms peculiar salts; it dissolves with vivid effervescence in the alkaline carbonates, and is not precipitated by an excess of them. Its alkaline salts are transparent, resembling gum, and become brittle by desiccation. They have a bitter taste, rather sweet at first. The ammoniacal salt, when completely dried in the sand-bath, gives with water a clear solution. The barytic salt is rather soluble in water, and deposits by cooling from a solution saturated by boiling, in crystals as light as feathers; it is in the alcoholic solution more particularly that it crystallizes regularly in colorless transparent prisms. If the alcoholic solution be evaporated by heat, the salt is deposited under the form of an oil, which solidifies by cooling; but in a short time, points of crystallization appear on the surface, and soon extend farther, and the whole mass ultimately becomes a heap of radiated crystals.

It follows, therefore, that bile inspissated, but not completely dried, is continually undergoing a progressive alteration, which gradually diminishes the quantity of biline. The products of which we have been speaking are then formed, and also some others. As biline begins to undergo alteration in the gall bladder, it is probable that this change is of the same nature as that which thickened ox-bile experiences, and in this case recent bile also should contain fellanic and cholanic acids: but M. Berzelius has not yet succeeded in assuring himself of this.

From the preceding it results that bile, especially when in the recent state, contains a combination of biline, bilifellic acid, cho-

linic acid, fatty acids and biliverdine with alkali. To this combination its odour, taste, and chemical properties are owing. It contains also other substances in small quantities.

We may conclude this extract with some of the author's considerations concerning the different principles of bile.

FELLIC AND CHOLINIC ACIDS, AND DYSLYSINE.

These bodies constitute what may be called the resin of bile. The substance to which M. Thenard gave this name was no other than a mixture of bilifellic and cholinic acids with fatty acids and with the green coloring matter of ox bile. Its picromel was a combination of bilifellic and cholinic, and fatty acids. Gmelin has shown that biline may be extracted from M. Thenard's resin of bile. That which Gmelin described as resin of bile was a product of the decomposition of biline, and was formed of fellic and cholinic acids, and of dyalysine.

BILIVERDINE.

This substance possesses the following properties: it is of a brownish green, pulverulent, inodorous, and insipid; it is destroyed by calcination, without melting and without giving any ammoniacal products, but leaving much porous carbonaceous residue. It is soluble in water: the caustic and carbonated alkalies readily dissolve it with a green color, and the acids precipitate it in flakes of a deep green. Dissolved in carbonate of ammonia, and left to spontaneous evaporation, it parts with the ammonia and becomes insoluble in water. By double decomposition it may be combined with other bases. Its tint varies: in some bile it is of a grass green. This substance is soluble in alcohol, but in small quantity, and is not precipitated from it by water: the latter gives a yellowish green color to the solution. A concentrated alcoholic solution is almost red, when looked *through*: ether also acquires a red color in dissolving it: the solution is very deep, although it contains but very little of it. It combines also with the fatty acids, which it turns green; it colors, under favorable circumstances, different animal substances, green or yellow: this coloring requires but an extremely small quantity of biliverdine. Sulphuric and hydro-chloric acids dissolve it with a fine green color, and concentrated acetic acid with a red color. It is very soluble in these acids. Nitric acid precipitates it from its combination with alkalies like other acids: if an excess of nitric acid be added, it is gradually destroyed and the solution is yellow.

These properties of biliverdine agree in all respects with those of chlorophylle: M. Berzelius is therefore disposed to consider them identical: he has likewise obtained it from bile with the three modifications of chlorophylle. The properties which have just been described naturally apply only to ox-bile: perhaps, indeed, they belong also to that of other herbivorous animals; but in that of carnivorous animals it has totally different properties, or, indeed, is combined with another coloring matter, from which it has not yet been possible to separate it.

ON RENNET.*

BY M. DESCHAMPS.

The rennet used for curdling milk is prepared by various processes: it is most frequently made with the stomach of the calf; sometimes, however, the mucous membrane of the stomach of the pig is used.

If we refer to books to learn what rennet is, we read that the matter which is found in the stomach of ruminating animals is thus called: or else, that rennet is that which is used for curdling milk, as the acid liquor which comes from the ventricle of calves, kids, &c., because it thickens and curdles milk. M. Berzelius, without withdrawing the name of rennet from the stomachal cheese (*fromage stomacal*) of the calf, applies it to the mucous membrane of the stomach, and thinks that this membrane contains a peculiar matter which curdles milk.

This difference of opinion—the remarkable action of rennet—its activity attributed by some to the acid which it contains, and by others to a peculiar matter—induced me to make a series of experiments with the view of discovering, if possible, the active principle of rennet.

I prepared liquid rennet with alcohol at 27° C., and a calf's stomach: eight drops of it were sufficient to curdle a quart of milk.

Some of this rennet was distilled in a retort. The result was gathered in a receiver cooled by a current of water. The distilled product was rather acid; it had the odour of rennet. The residue was thick and very acid; its odour was that of toasted Gruyere-cheese.

I put 750gr. of milk into three vessels. I poured into the first, five drops of the distilled product; into the second, five drops of the residue; and into the third, five drops of each: nothing was produced.

I exposed to the sun, in the month of June, rennet contained in a flask; it became thick, and lost its action on milk.

I evaporated 30 gr. of it to dryness over sulphuric acid, and I obtained a very powerful rennet.

* *Journal de Pharmacie*, June, 1840.

Eighteen drops of rennet, poured into 125 gr. of boiling milk, produced no effect.

I mixed 15 drops of rennet with 125 gr. of cold milk, and boiled it rapidly; the milk underwent no alteration.

Rennet was saturated with calcined magnesia, and three drops coagulated 250 gr. of milk.

I rendered rennet alkaline with a solution of bicarbonate of soda; this liquor poured into milk coagulated it.

I put some rennet into a matrass, and heated it in a sand-bath: it began to lose its transparency at 45° C., and the turbidness increased until 60° C. Three drops heated to 45° C., and eight drops heated to 50° C. separately curdled 125 gr. of milk. The coagulation was slower with rennet heated to 50° than with that heated to 45° C.: the slowness of the operation is indicated by the cream which separates. A spoonful of rennet, heated to 60°, did not affect 125 gr. of milk.

In order to ascertain what part of the calf's stomach it is that produces the rennet, I dissected the mucous membrane of a stomach, and I put the serous membrane, together with the muscular membrane, in 300 gr. of alcohol, at 27° C.: after three months' maceration, I mixed, without any result, 20 gr. of this liquor, with 125 gr. of milk. The cheese was wrapped in a cloth, and put in 300 gr. of alcohol, at 27° C. After one month's maceration, the liquor was only very weak rennet. The mucous membrane was put in 130 gr. of alcohol at 27° C. After a month's maceration the liquid acted as a weak rennet; it required twenty drops to curdle a quart of milk. I put a little chloride of sodium in the flask, and obtained a powerful rennet: one drop coagulated 170 gr. of milk.

The mucous membrane of a calf's stomach, which had been macerated in 375 gr. of alcohol, at 27° C., and which had produced a weak rennet, was taken out of the flask after one month's maceration, and was washed and put into a flask with alcohol at 27° C., and 6 gr. of salt; next day three drops coagulated 250 gr. of milk.

The mucous membrane of a calf's stomach was exhausted by alcoholic and aqueous maceration.* The former were made with 800 gr. of alcohol at 27° C., and lasted seven months. The latter were continued with 8000 gr. of water, and lasted only twelve hours each. After this time, the mucous membrane was dried; it did not redden blue turnsole paper, when the latter was applied to its inner and moist surface. One part of this dried membrane was put into 1800 parts of unskimmed milk, and the temperature was raised to 50° C.: at 45° the coagulation was complete. The membrane was separated, washed, dried and weighed: there was no loss. This membrane was again put into a quantity of milk equal to the first; the milk was heated to 50° C.; and, as should be, there was no action.

Boiling milk was not altered by the exhausted mucous membrane.

After having ascertained that the active principle of rennet was produced by the mucous membrane of the stomach, I endeavoured to ascertain whether another part of the digestive tube did not contain it, and whether this matter were peculiar to mammiferous animals. From these investigations it results that this matter is not contained in the other parts of the digestive tube;† that it does not exist either in the craw or the succenturial ventricle of gallinaceous birds, but that it does exist in their gizzard; that it belongs to the stomach of all animals,‡ and that its functions are essential to digestion, for they promote chymification.

Liquid rennet is of a light amber, when it has been prepared with a calf's stomach and alcohol at 27° C. Its odour is buttery; its action on test papers is acid. When it is saturated, it becomes thick and disengages ammonia. If, after having saturated rennet with diluted ammonia, it be filtered, a transparent liquid, which has the odour of rennet, is obtained; it has no action on milk: six spoonfuls did not cause any alteration in milk. If the filtered liquor be left in a corked flask, there are deposited on the sides of the flask, small crystalline grains composed of ammoniacal phosphate of magnesia. The filtered liquor was acidulated with tartaric acid introduced into a retort, and distilled in order to obtain 500 gr. of product. These 500 gr. were saturated with ammonia, and distilled to obtain 250 gr. The residue was neutral; tartaric acid was added, and the distillation was continued. These two products were saturated with potassa, and evaporated; they contained, the first capric acid, and the second caproic and butyric acids. In another experiment, the first distillation was continued in such a manner as to have a greater quantity of liquor, and the first product of the distillation contained capric and caproic acids, and the second butyric.

The rennet contained:—

Hydro-chloric acid in very large quantity.

Butyric acid.

* This experiment differs from that of M. Berzelius.

† I have however remarked the action of this matter with the portion of the duodenum which precedes the *ductus communis choledochus;* but this evidently arose from the duodenum having been cut too near the pylorus.

‡ I generalise only by induction.

Caprolc acid.
Capric acid.
Lactic acid.
Chloride of ammonia.

Chloride of sodium, independent of that which was added: the chloride added increased the secretion of chloride of ammonia.

Magnesia, not in the state of ammoniacal phosphate of magnesia.

Soda, probably with magnesia, in the state of lactate.

Traces of sulphate.

Phosphate of lime.

And a peculiar matter, which I call *chymosine*, from χυμος, chyme, χυμωσις, chymification.

In order to obtain chymosine in the rough state, a slight excess of ammonia is poured into rennet. The precipitate is filtered, washed, and dried. Dried chymosine resembles gum or emulsin. It is insoluble in water; its insolubility is so great, that even after an immersion of some hours, it may be pulverized under that liquid; but it is soluble in acidulated water. This solution possesses the property of coagulating milk. Hydro-chlorate of chymosine was precipitated by ammonia, acidulated with hydro-chloric acid, then saturated with ammonia until the liquid began to become thick: notwithstanding these repeated operations, it still curdled milk.

This solution is not so strong as rennet, that is to say, the quantity of chymosine extracted from a given quantity of rennet cannot reproduce a similar quantity of the latter. Its action proves only that this property is not extinct in isolated chymosine.

Water, acidulated with sulphuric acid, separates from chymosine the phosphate which is precipitated with it.

The solution of chymosine is precipitated by all the alkalies, the carbonates of potassa, soda, and ammonia, and by tannin.

Iodic acid is decomposed and iodine set free, when it is poured into this solution.

Chymosine burns with a flame, and leaves a shining carbonaceous residue.

From the above I think I may conclude:—

That rennet is a fit name for the mucous membrane of the stomach:

That rennet may be concentrated without being altered:

That the action of rennet on milk is not attributable to the acid it contains, because it acts even after it has been saturated, because the heat of the solar rays, and a temperature of 60° C., deprive it of this property, and because heat exerts on the mucous membrane an action similar to that which it exercises on rennet:

That chymosine is the active principle of rennet:

That the action of isolated chymosine cannot be attributable to the acid used to dissolve it:

That chymosine is secreted only by the mucous membrane of the stomach:

That the stomachal cheese (*fromage stomacal*) performs the functions of rennet only because it is impregnated with chymosine:

That the proportion of chymosine required for coagulating 1000 gr. of milk is excessively small, since that quantity may be curdled with eight drops of liquid rennet, and since part of the mucous membrane of a calf, perfectly exhausted, at 45° C., of temperature, coagulated 1800 grammes of milk:

That the acidity of rennet favours its action:

That a temperature of 20 to 25° C., is very favourable to the action of rennet:

That chloride of sodium acts as a stimulant on the mucous membrane, and that this action increases the secretion of chymosine:

That the action of chymosine cannot yet be explained; and that in saying that the caseous matter undergoes an isomeric alteration by the action of rennet, or that the action of rennet is carried on by virtue of the catalytic power, is, without accounting for phenomena, only making use of expressions to which the mind is accustomed.

I have given the name of *chymosine* to the matter secreted by the mucous membrane of the stomach, because this name relates only to chymification, or the first part of digestion: whilst the word *peprine*, on the contrary, relates to the entire digestion, namely, to chymification and chylification; and because we see the food transformed into chyme, whilst we cannot see the passage of chyme into chyle.

If it were permitted to us to apply to the organs of living animals the observations made after death on those same organs, it would be easy to explain otherwise than at present some parts of the phenomena of digestion.

When the animal introduces nutritive matters into its mouth, the digestive apparatus is excited, the saliva runs out, and, during mastication, is mixed with the alimentary matters, and renders them alkaline. Mastication being finished, these matters penetrate into the stomach, and meet with the gastric juice, which transforms the uncombined soda of the saliva into chloride of sodium. This chloride acts on the mucous membrane of the stomach as a stimulant, and augments the secretion of chymosine, which is dissolved in the excess of hydro-chloric acid, which the gastric juice contains. The matters accumulated in the stomach are agitated by the motions of that organ, penetrated by the gastric juice, and insensibly transformed into chyme, under the influence of temperature, of chymosine and of its solvent.

This operation terminated, the chyme passes through the pylorus, and is mixed in the duodenum with the pancreatic and biliary juices, which necessarily modify the chylous matter, before presenting it to the chylous vessels. If a morbid affection changed the nature of the secretion of the mucous membrane of the stomach, chymosine would not have any action; for it would meet, if it were secreted, only a liquid capable of precipitating it, and digestion could not be conveniently carried on. If, on the contrary, the acidity of the gastric guice were too great, this liquid would have too powerful an action on the mucous membrane, and the animal would be fatigued, &c.

It is true that this theory does not account for all the phenomena of nutrition; but it explains, in a more probable manner, the action of the saliva in digestion, for it appears to me impossible to admit as a principle, that the uncombined soda acts as solvent of the nutritive matters, since, in man, for example, the food remains but a short time in the mouth, and arrives, without stopping, in the stomach, where it meets with an excess of hydro-chloric acid which does not allow it to remain free. In animals which, like ruminating animals, have several cavities in which the food remains for a time, this mode of considering it would be the easiest to sustain: but it may easily be conceived, that the nutritive matters of these animals being hard to digest, it was necessary to delay their entering into the stomach, and that they were obliged to be well-divided and well-softened, in order to present to that organ matters easily transformed into chyme, and that these macerations would not be sufficient to sustain the solvent system, when indeed even the solution of albumen is relied on, for this solution is obtained, in the experiments of the laboratory, without the presence of an alkali.

In gallinaceous and other birds, the nutritive matters remain for a long time in the craw, stay again, before passing into the gizzard, in the succenturial ventricle, and in this course, meet only an acid liquid.

This theory, which is corroborated by our use of sea-salt in food, by its well-established digestive action, and by the presence of hydro-chloric acid, and of chloride of sodium in all stomachs, in an indirect manner, explains the action of bicarbonate of soda in bad digestions; for this salt acts by its acid, by its base, and by the chloride of sodium which is formed, and not by its solvent action, for it is not more probable than the solvent action of saliva in mastication.

AFFINITIES OF OXYGEN AND HYDROGEN FOR CERTAIN BODIES.—ELECTRO-CHEMICAL DECOMPOSITION OF WATER.*

BY M. EDMUND BECQUEREL.

M. E. Becquerel read the following extract from a Memoir entitled: *Investigations concerning the electro-chemical decomposition of water.*

When we subject to the decomposing action of the pile, water holding in solution substances which have an affinity for oxygen or hydrogen, these substances aid in its decomposition. If, for example, we pour it into a vessel of water holding chlorine in solution, and if we steep in it two platinum electrodes, in connection with a small Wollaston's pair, of 4 centimetres square, and feebly charged, the water is immediately decomposed; the oxygen only is disengaged at the positive pole, whilst the hydrogen, at the other electrode, is combined with the chlorine, forming hydrochloric acid: a small quantity of oxygen is absorbed, as we shall see farther on. But if, instead of employing a single pair, three or four, or a number sufficient to decompose the acidulated water, be taken, hydrogen is then disengaged at the negative pole, as may readily be conceived: in this case, the quantity of hydrogen is such that it does not meet with, at the moment when it is in the nascent state on the sheet of platinum, all the chlorine necessary for forming hydro-chloric acid, for it requires some time for the chlorine to come from the different parts of the liquid. This experiment shows that water may be decomposed with a single small ordinary element—a fact which has never before been observed. Nevertheless, it was known that, in peculiar circumstances, as in the simple apparatus for the disengagement of oxygen, such as that which M. Becquerel, sen. invented, the simple action of nitric acid on potassa produced an electric current capable of decomposing water. If we dissolve in water, salts whose bases may become superoxidized, such as the sulphate of protoxide of iron, the solution is again decomposed with a single couple; in this case, there is a disengagement of hydrogen only at the negative pole.

These principles will serve us for comparing the energy with which these substances combine with one another. We operated in the following manner:—

We first took two vessels, each fitted with two platinum electrodes: two of these electrodes communicated with each other, and the two others were put in communication with the poles of a battery: one of the

* *Société Philomatique de Paris*; sitting of the 13th of June, 1840.

vessels contained chloruretted, and the other, acidulated water. By taking successively two and three couples of the pile charged with acidulated water, there was no disengagement of gas in the two vessels. With four couples, the acidulated and chloruretted waters were decomposed. With the latter, there was, as above, a disengagement only of oxygen; but by increasing the number of couples, hydrogen began to be disengaged in the chloruretted water. On examining the results comprised in my Memoir, it was evident that, in the vessels containing chloruretted water, not only was hydrogen absorbed, but also some oxygen. This effect was easily recognised by collecting the disengaged gases, for, according to Mr. Faraday's principle, the same quantity of water ought to be disengaged in both vessels.

Four vessels were afterwards taken similar to the preceding, and communicating together in such a manner that the current of a pile passed equally into the four vessels. In the first was put chloruretted, in the second, bromuretted, and in the third, iodized water. The fourth, containing acidulated water, was used as a voltameter. An electric current was then passed into this system, and the absorption of the gas disengaged in these different vessels was measured. Similar results may be obtained by taking solutions of chlorine, bromine, and iodine in such a manner that these bodies may be in equal atomic proportions, by employing only weak currents, and by taking other precautions mentioned in my memoir. The following numbers represent the proportions of absorption of hydrogen and oxygen by chlorine, bromine, and iodine:—

Absorption of hydrogen by	Chlorine	922
	Bromine	712
	Iodine	212
Absorption of oxygen by	Chlorine	169
	Bromine	380
	Iodine	469

As the greater affinity the bodies dissolved in water have for hydrogen and oxygen, the greater is the quantity of gases absorbed, it follows that these numbers show the energy with which the gases that enter into the composition of water combine with chlorine, bromine, and iodine. It would be curious to ascertain whether these numbers are the same as those found by my father's process for measuring the affinities of bodies for one another.* However, I present these results only as pointing out a process by which to compare the affinities of certain bodies for each other.

In the second part of my memoir I have given the study which I made concerning the action of spongy platinum and gold on oxygen and hydrogen, when those substances act as the electrodes of a pile. I have ascertained that these two bodies absorb the gases in nearly the same proportions, and that the proportion of the absorption of the hydrogen is to that of the oxygen as 2·5 to 1, or thereabouts.

PECTINE, PECTIC ACID.—FERMENTS.†

BY M. FREMY.

At a sitting of the *Société Philomatique de Paris*, held on the 16th of May, 1840, M. Frémy read the following note, relating to communications which he made verbally to the Society at the preceding meeting.

I had the honour of communicating to the Society at its last sitting a summary of my investigations concerning pectine and pectic acid. In my work I have shown that these two bodies differ only in their capacity of saturation, and that they have the same elementary composition. Pectine may be converted into pectic acid under the influence of a ferment found in all fruits, and in some roots. I think I have shown that this transformation explains certain phenomena which have been observed in the ripening of fruits. Pectic acid may also, under the influence of alkalies in excess, be changed into a new acid, which I call *metapectic*, and which differs from pectic acid in its capacity of saturation, which is more powerful. These different substances are of remarkable instability, and frequently undergo an alteration in water: I have termed them *bodies of transition* (*corps de transition*). Indeed, I think that an organic substance, before arriving at a fixed state, must go through a series of successive modifications. It is a series of this nature that I considered in my former work.

In the second place, I communicated the conclusion of the experiments on ferments, undertaken by M. Boutron-Charlard and myself. We were enabled very accurately to ascertain the circumstances and agents which determine the formation of lactic acid. All the animal matters which act as ordinary ferments may, in time, undergo a modification which gives them a new and more energetic power. They acquire, indeed, the property of transforming into lactic acid, not only sugar, but also dextrine, gums, starch, &c. The action of animal matters is neutralized when they are subjected to a temperature of 100° C. We hope that the examination of these phenomena will enable us to explain the formation of acids in vegetation: it has already led us to a very easy process for preparing

* See *The Chemist*, No. VI, page 164.

† *L'Institut*, No. 335.

lactic acid, which acquires, as every one is aware, importance from its new applications in medicine. It is well known that cross-spired barley contains a principle capable of converting starch into sugar, which is called diastasis: barley contains, moreover, a very large quantity of an animal matter, which may form lactic acid by undergoing certain modifications. We take cross-spired barley and slightly damp it, and keep it for three or four days in a corked flask. During this time, the animal matter contained in the barley is modified, the temperature raised, and if the barley thus acted on were submitted for two or three days to water at 40° C., the water became very sour, and contained a very considerable quantity of lactic acid. It is evident that in this case the diastasis transforms the starch into dextrine and sugar, which are immediately converted, under the influence of the animal matter, into lactic acid.

ON THE PRECIPITATION OF CERTAIN METALLIC OXIDES BY WATER.*

BY H. ROSE.

In a memoir which I published a short time ago, I compared the formation of ether by a mixture of sulphuric acid and alcohol, to the decomposition of several inorganic salts by the intermedium of water. I endeavoured to give probability to the opinion which admits that it is water, which in these cases performs the function of a base, and separates the oxide of ethyle or the metallic oxide, the latter in the state of an ordinary basic salt.

The inorganic salts which I mentioned as examples in this comparison, are those of oxide of bismuth, of deut-oxide of mercury, and of oxide of antimony. Water causes them to undergo the decomposition in question, even at the ordinary temperature: but ether is separated from a mixture of sulphuric acid and alcohol, or sulpho-vinic acid, only at a high temperature.

Among the weaker inorganic bases, there are, however, many which are separated from their combinations with acids by water, only at an elevated temperature, and the decomposition of the salts of these bases by water is therefore better suited to a comparison with the formation of ether.

To these bases belongs more particularly the oxide of iron which water precipitates at a high temperature in the state of a basic salt from the solutions of most of its neutral salts. The more the solution of the salt of oxide of iron is diluted, the lower should be the temperature required for its precipitation, the more complete is the separation, so that at a certain degree of dilution there remains no more oxide of iron in the liquor, as M. Scheerer has demonstrated; but the whole mass is separated in the state of basic salt. As water does not precipitate it from the more energetic bases, even at a boiling heat, this property of oxide of iron has been turned to account in separating it from the oxides of cobalt, nickel, and other metals. It may also, by boiling the liquor, be separated from alumine, which has, it is true, much resemblance to this oxide with respect to its properties, but which evidently is a more energetic base; this separation of alumine and oxide of iron by water, at a high temperature, has a certain importance in a manufacturing point of view, because, in the manufacture of alum, boiling is sufficient to precipitate the oxide of iron contained in the liquor, and its preparation with alumine is thus rendered more easy than that of the protoxide, which is, for this reason, much more prejudicial: oxide of iron forms, however, with sulphuric acid and the alkali, an alum completely analogous to that formed with alumine, and which, on account of its isomorphism with the latter, might be crystallized with it in all proportions.

Many other bases act like oxide of iron; they all belong, like it, to weak bases; it is the same with several substances which perform the office of bases with strong acids, and are, for this reason, frequently reckoned in the number of the acids. Such are zirconium, thorinum, oxide of cerium, deut-oxide of tin, titanic, tantalic, and tellurous acids, and, in a certain point of view, molybdic, wolframic, and vanadic acids. Many combinations of these oxides with acids may be dissolved in cold water, and are precipitated by boiling, in the state of oxides or of basic salts.

Many of the oxides precipitated in this manner possess properties which they did not present before their solution in, and their separation from, the acids. They are less attackable than before: some become less soluble, and others quite insoluble in acids, and do not combine with them immediately after precipitation, even when the latter are concentrated. In this manner may be ranked titanic acid, deut-oxide of tin, and many others. This is, in some measure, analogous to ether, which, when once it is separated by boiling from a mixture containing sulpho-vinic acid, appears not to combine immediately with acids, to form salts.

* *Annalen der Physik und Chemie*, vol. xlviii, p. 573.

ON CHLORO-NAPHTHALIC ACID AND ON CERTAIN COMPOUNDS OBTAINED BY TREATING CHLORIDES OF NAPHTHALINE BY NITRIC ACID.*

BY M. LAURENT.

At a sitting of the Royal Academy of Sciences of Paris, held on the 22nd of June, 1840, M. Laurent read extracts from two memoirs on the above compounds: in the first he makes known:—

1. Chloro-naphthalic acid, which is yellow, crystallized, and volatile, without being decomposed. The salts which it forms are of great beauty, and may be obtained in the crystalline form; they exhibit brilliant colors, which vary in all shades, from golden yellow to carmine, passing by the orange and red tints.

The very remarkable composition of this acid is represented by $C^{40}\ H^8\ Cl^2\ O^3 + O^2$. It is contrary to the theory of substitutions, for the naphthaline has lost four equivalents of hydrogen, which have been replaced by six equivalents of chlorine and oxygen.

2. Oxy-chloro-naphthalose, which is crystallizable, volatile, without decomposition, and unalterable by the alkalies. Nitric acid converts it into naphthalic acid. Its formula is $C^{40}\ H^8\ Cl^4\ O^2$: it represents naphthaline which has changed four equivalents of hydrogen for four of chlorine and hydrogen.

3. Oxy-chloro-naphthalenose, which is crystallized in needles, and is unalterable by distillation, the alkalies and nitric acid. Its formula is $C^{10}\ H^6\ Cl^6\ O$. It represents a naphthalic radical, which has lost 22 atoms of carbon without substitution. These three compounds are obtained with nitric acid and hydrochlorate of chloro-naphthaline.

In the second memoir we find;—

1. Bromide of benzine, the composition of which is $C^{24}\ H^{12} + Br^{12}$.

2. Bromo-benzinise, whose formula is $C^{24}\ H^6\ Br^6$. The first is obtained by bromine and benzine; the second by treating bromide of benzine by potassa.

3. Broméine crystallized in square laminæ, and undecomposable by distillation and by the alkalies: its formula is $C^{20}\ H^6\ Br.^4$ It is derived from a carburetted hydrogen $C^{20}\ H^{10}$, which ought to be found in the crude benzine with which this substance was made.

* *Compte Rendu de l'Académie des Sciences*, No. 251. For another paper on compounds of naphthaline, by the same author, see *The Chemist*, No. VII, p. 201.

COMBINATIONS OF CYANOGEN WITH CHLORINE.

M. Persoz communicated to the *Société Philomatique de Paris*, at its sitting of the 8th of April, 1840, certain results which he obtained in examining the combinations of cyanogen with chlorine. He made known the process by which he prepared protochloride of cyanogen, and the curious phenomena presented by this compound. Left to itself, protochloride of cyanogen undergoes a modification analogous to that which cyanous acid experiences: it is converted into a solid product (the perchloride), into a liquid and into a pulverulent matter.

NEW COMPOUND OF ANHYDROUS SULPHURIC ACID WITH OXIDE OF AZOTE.

BY H. ROSE.

M. Rose read to the Royal Academy of Sciences of Berlin, at its sitting of the 22d of July, 1839, a memoir of the above title.

If dry gaseous oxide of azote be driven into anhydrous sulphuric acid, a hard, white body is obtained, which does not fume, which quickly attracts moisture from the air, and which is gradually resolved into a colorless fuming liquid. When thrown into water, it is immediately dissolved, evolving an abundance of red vapours: the solution contains sulphuric and nitric acids. If it be thrown into water in an exhausted receiver, it immediately develops a colorless gas which forms reddish vapours, from the time that atmospheric air is introduced. Concentrated sulphuric acid dissolves a great quantity of this compound of sulphuric acid and oxide of azote; the latter cannot be driven off from this solution without the aid of heat. If water be added to this solution, it is immediately disengaged by the contact of the air, in abundant red vapours. If a small quantity of this compound be thrown into a solution of green vitriol, the latter is colored of a deep black. In other saline solutions, on the contrary, no change whatever is remarked. Alcohol converts this body into nitric ether: with ammonia it produces sulphate of ammonia at a high temperature, and with the contact of the air it is quite volatile. In this compound, the acid, as in the neutral sulphates, contains three times as much oxygen as oxide of azote.

EXAMINATION OF AN INTESTINAL CALCULUS FROM A HORSE.†

BY M. J. GIRARDIN.

In the year 1839, a miller, residing at Varengeville, lost successively five horses

† *Journal de Pharmacie*, June, 1840.

without any apparent cause. There were found in the intestines of these animals voluminous calculi, in great number; to their presence, doubtless, the death of the horses must be referred.

M. Arsene Maille, a very distinguished naturalist, having collected many of the calculi, hastened to send me one, requesting me to analyse it. This calculus had been expelled by the horse, in the natural way, a little before death. At the same time M. Maille informed me that the miller was in the habit, like the rest of his fraternity, of feeding his horses with bran, at least, to a great extent, and he asked me if this regimen had not some influence on the production of the calculi found in such great number in the bodies of these animals.

I immediately recollected an interesting note published in 1831 by M. Lassaigne in the *Journal de Chimie Médicale*, in which that chemist gives it as his opinion that the use of bran and pollard, given to the mules of Alsace, was the predisposing cause of the intestinal concretions which occasioned the death of those animals. M. Lassaigne founded his opinion:—first, on the chemical nature of these concretions, which were formed almost entirely of ammoniacal phosphate of magnesia; secondly, on the experiments of M. Theodore de Saussure, which show that the phosphates are much more abundant in the seeds of *cereal* plants than in the straw and hay. Indeed, from the comparative analysis of the straw and seeds of wheat, made by M. Saussure, it is evident that whilst the former contains only 11 per cent. of alkaline and earthy phosphate, the latter contain 76·5 per cent. of them.*

It was necessary to corroborate M. Lassaigne's opinion by new facts; and as the observation made by M. Arsene Maille left no doubt as to the nature of the regimen to which the horses had been submitted, I proceeded at once to the analysis of the calculus which he had sent me.

This calculus was triangular, with smooth and rounded edges, and its irregular form, as well as its worn faces and edges, showed that it had not been alone in the intestines of the horse. Its size was that of a large apple. It was broken in two, and in its centre was presented a nucleus bigger than a filbert, of the same appearance and color as the rest of the calculus. This nucleus presented in its interior a small flattened white and crystalline fragment of carbonate of lime. When it was sent to me, it weighed 311 grammes. It must have weighed more at one time, for it was notched in several places. Externally, it was of a light color: its surface was very smooth. Internally, it had a crystalline texture, and was of a brownish yellow color. No concentric layers could be perceived in it. The crystalline lamellæ were all disposed in radii diverging from the centre to the circumference. It was very soft, and might be cut with a knife. Its powder was of a light bay color. Its density was 1·741.

Reduced to a fine powder and exposed to a heat of 100° C., it exhaled abundant ammoniacal vapours: even at the temperature of + 40°, it yielded water and ammonia, and was completely discolored. This disengagement of ammonia was because the ammoniacal phosphate of magnesia which the calculus contained was decomposed and lost great part of its volatile base at the lowest temperatures, as I have ascertained by acting directly on pure salt purposely prepared. This interesting fact had not yet been pointed out. It is common to all the other ammoniacal salts: we ought also to pay attention to this when it is required to determine their proportion of water of interposition and crystallization.

Submitted to analysis, this calculus presented the following composition:—

Water of interposition . . .	14·00
Ammoniacal phosphate of magnesia.	48·00
Phosphate of lime	19·00
Coagulated animal matter insoluble in acids and in water . . .	0·80
Matters soluble in water, consisting of aluminate of soda, sea salt, alkaline carbonates, salts of lime and magnesia	6·60
Extractive matters soluble in alcohol, with sea salt, salts of magnesia, and fatty matter . . .	4·00
Fatty matter soluble in ether . .	7·00
Loss . .	0·60
	100·00

The chemical composition of this calculus shows the cause of its formation; this certainly consists in the nature of the food given to the horses. The practical consequence of this observation is, that the feeding of animals exclusively on bran and pollard must be avoided, in general with the different substances which contain a great quantity of earthy phosphates.

* *Investigations concerning vegetation.*

QUINIC ACID.—QUINOYL.†

BY A. WOSKRESSENSKY.

A memoir on a new substance called *quinoyl*, extracted from quinice acid, was read by M. Woskressensky to the Academy of Sciences of St. Petersburg, at its sitting of the 16th of August, 1839. In a paper, some time since published in the *Annalen*

† *L'Institut*, No. 337, June 11, 1840.

der Pharmacie, vol. 27, the author made known the composition and chemical properties of this substance. He now spoke of the modifications which it undergoes by the action of dry chlorine gas, in a glass tube.

Chloride of quinoyl is solid at the ordinary temperature, friable, soft to the touch, and of a peculiar, penetrating, aromatic odour. It decomposed organic substances, communicating to them a deep red color. It is but little soluble in water, and very soluble in ether and hot alcohol, from which it is precipitated by cold water. Notwithstanding the considerable quantity of chlorine contained in this product, it loses in it its characteristic properties, and becomes *latent*; its presence is detected only by means of the total decomposition of the substance brought to its inorganic elements. The composition of chloride of quinoyl is represented by the formula C^{12} H^2 O^4 Cl^{16}. The author of the memoir sees in these facts a new argument in favour of the theory of substitutions. Indeed, says he, by exposing quinoyl to the action of chlorine, we have obtained a new product in which the constituent parts of quinoyl remain the same, except that six atoms of hydrogen have been replaced by an equivalent quantity of chlorine. There is reason to suppose, he adds, that this substitution is gradually effected, and that at the commencement there is formed a body in which four atoms of hydrogen are substituted by as many atoms of chlorine. By continuing the action of the chlorine, with heat, the decomposition goes farther: two atoms more hydrogen are eliminated, and thus the substance of which he speaks is formed.

RESIN OF ELEMI.

At a sitting of the Imperial Academy of Sciences of St. Petersburg, M. Hess read a paper on the composition of resin of elemi, the object of which was to maintain the formula of C^{40} H^{66} O, as being that which ought to represent the composition of this resin, contrary to the opinion of M. H. Rose, who, according to his analyses, represented it first by C^{20} H^{30} O, but afterwards by C^4 H^{66} O. M. Hess is supported not only by his analyses just mentioned, but also by the recent ones of M. Marchand, which lead to exactly the same formula.

MANNER OF REDUCING POISONOUS METALS.*

BY M. GAEBEL.

This consists in mixing the substance to be examined with formiate of soda, and in heating it gently in a tube, by means of a spirit-lamp. M. Gaebel says he has thus detected $\frac{1}{1000}$ of sulphuret of arsenic in kermes, in yellow sulphur, and in sulphuret of antimony.

It is much to be regretted that the author has not given more details in support of his investigations.

* *Journal für prakt. Chemie.*

METHOD OF SEPARATING PALLADIUM FROM COPPER.†

The mixture is dissolved in nitric acid, and a great quantity of water is added to the solution; it is boiled with formiate of potassa until carbonic acid is disengaged. The palladium is then reduced, and the copper remains in solution. If it contains silver, the latter is also reduced.

MODE OF SEPARATING OXIDE OF IRON FROM PHOSPHORIC ACID.

BY M. ERDMANN.

This chemist recommends that the phosphate of iron be precipitated by ammonia, and that the precipitate be calcined with carbonate of soda, which combines with the phosphoric acid. If the precipitate still contain phosphate of alumine, it is to be dissolved in alkaline water; but the phosphate of alumine may also be precipitated in the state of a basic salt, by saturating the solution of soda by a slight excess of nitric acid, and by adding ammonia. The liquid is afterwards acidulated by acetic acid, and precipitated by acetates of lead.

SEPARATION OF COBALT FROM MANGANESE.

M. Doebereiner proposes, as a means of separating cobalt from manganese, to dissolve the chlorides of these two metals in a little water, and to add to the solution fifteen or twenty times its volume of ether. The chloride of manganese is precipitated, whilst the chloride of cobalt remains dissolved, presenting a blue tint. The chloride of manganese is redissolved in anhydrous alcohol; it is again precipitated by ether; this operation is repeated a third time, in order to obtain the cobalt pure.

SPONTANEOUS COMBUSTION.†

Mr. Marsh, chemist, connected with the

† *Inventor's Advocate.*

Royal Arsenal, recently discovered that it is an invariable rule with iron which has remained for a considerable time under water, when reduced to small grains, or to an impalpable powder, to become red-hot, and to ignite any object with which it may come in contact. This he experienced by scraping some corroded metal from a gun, which ignited the paper containing it, and burnt a hole in his pocket. The knowledge of this fact may be useful in accounting for spontaneous fires, the origin of which has never been traced.

IODIDE OF CINNAMYLE.*

We are informed by Mr. Scanlan, that the iodide of cinnamyle, claimed by M. Despan as his own discovery,* was in reality discovered by Mr. William Moore, of Dublin, and examined by that gentleman and Dr. Apjohn. We are greatly obliged to Mr. S. for giving us an opportunity of correcting the error. This notice should have been inserted in our last No., but it was accidentally omitted.—EDITORS.

* See *The Chemist*, No. 6, p. 170.

II. CHEMICAL MANUFACTURES.

ON THE FORMATION OF ACETIC ACID, FROM CARBONIC OXIDE AND HYDROGEN, IN THE ACETATES OF COPPER AND IRON.*

BY MR. J. T. JULLION.

In the *Bibliotheque Universale* is the following experiment of M. Matteuci's, on the production of acetic acid from carbonic oxide and hydrogen. It was performed by injecting a current of oxide of carbon into water containing copper in suspension. To obtain the copper in so fine a state of division, the acetate was calcined until decomposition took place, and oxide of copper was left; over this a current of hydrogen gas was passed, with the aid of heat, until the whole of the oxide was reduced to the metallic state. The oxide of carbon was prepared by submitting to the action of heat, in a gun barrel, one part of powdered charcoal, previously calcined, with three parts of carbonate of lime; that, as the carbonic acid was eliminated from the carbonate of lime, one equivalent of oxygen might be absorbed by one equivalent of carbon, thereby forming two equivalents of oxide of carbon, as shewn in the following diagram:—

Carbonic acid { 1 carbon 6, 1 oxygen 8 } 14 { 1 equivalent of oxide of carbon.
1 oxygen 8 } 14 { 1 equivalent of oxide of carbon.
Charcoal = 1 carbon 6 }

For the absorption of any portion of carbonic acid that might escape reduction by the charcoal, some lime was placed in a cool part of the barrel, and the gas passed over it. The metallic copper was now placed in a vessel containing distilled water; into this the oxide of carbon was passed, and in a short time the water assumed a greenish tinge, the colour continuing to increase in intensity in proportion to the quantity of gas absorbed. M. Matteuci therefore concluded that the color was derived from the formation of acetate of copper, which, dissolving as it was formed, imparted its hue to the water; he imagined that the decomposition of the water was effected by the carbonic oxide combining with the hydrogen to form acetic acid, and the oxygen uniting with the copper, forming the oxide which saturated the acid as soon as it was produced.

To prove that this conclusion was correct, the solution was filtered, and part of it evaporated. It gave an abundant brownish red precipitate, with ferrocyanate of potassa, with sulphuretted hydrogen a black precipitate was obtained, and an acid liquor left, which after being exposed to heat, gave a soluble salt with oxide of lead; part of the liquor evaporated gave some small green crystals; these, treated with sulphuric acid, disengaged vapours which had the properties of acetic acid.

Some of this acid liquor was treated with oxide of iron, when a greenish soluble salt was formed; a portion of these crystals, exposed to atmospheric air, were decomposed, and a reddish brown powder was the result. On substituting the oxide for metallic copper, no acid was formed; but on passing a current of cyanogen into water in which copper was suspended, the same effect was obtained as with the oxide of carbon.

* Communicated by the Author.

Now, acetate of iron, being an article of great demand in this country by the dyers and calico-printers,—for whose use a considerable quantity is prepared and sold under the name of iron liquor,—I thought that the foregoing experiment might be turned to some practical purpose, especially as iron is more easily oxidized than copper. Should this be the case, it would furnish a much more economical mode of preparing that liquor than the one now in practice, of adding a solution of acetate of lead to a solution of sulphate of iron, whereby a double decomposition is effected, sulphate of lead precipitating in a white flocculent powder, acetate of iron remaining in solution.

Under this impression I tried the following experiments, very much to my satisfaction, and have no hesitation in recommending it to the trade generally, as a process for producing that article, fully as well adapted to their purpose, and possessing the same properties, as the solution of acetate now in use. In point of economy, it has a decided advantage, as the carbonic oxide is producible at the lowest possible expense, from a source most bountifully supplied by nature; whereas, the acetate of lead must be made in the first instance from an expensive article, the pyroligneous acid, from which it is produced, having previously to undergo the process of purification, to separate the tar which would otherwise prevent the acetate of lead from crystallizing. The simplicity too of the operation, and the total absence of any complicated machinery, are great recommendations in its favour, and will, I trust, tend to its introduction on the manufacturing scale.

I procured pulverulent iron by precipitation of the carbonate, from sulphate of iron, or green vitriol, by means of carbonate of soda, —the common crystallized soda of the shops answering as well for this purpose for the best or pulverulent carbonate. The precipitate, after being dried, was placed in a porcelain tube, in a furnace, and a current of hydrogen gas was passed over it, until the whole of the oxide was reduced to the metallic state, when it formed a black, porous, spongy mass. I must here state that this was done at a heat considerably below redness. The ends of the tube were then carefully stopped with clay, to prevent the access of air, and withdrawn from the fire, when it was allowed to grow cold; for should the ends not be stopped, and the air in consequence gain access to the iron before it is quite cold, the whole becomes incandescent, and takes fire spontaneously, burning like tinder until the entire mass is reconverted into oxide. This spongiform mass was gently triturated in a mortar, and placed with some distilled water in a vessel furnished with an agitator; to this vessel a pipe was attached, which connected it with a glass retort for the generation of the oxide of carbon, through which the gas was conducted to the vessel. I procured the carbonic oxide from oxalic acid, by decomposing it by sulphuric acid with the aid of heat; as oxalic acid is composed of one equivalent of carbonic oxide, one of carbonic acid, and one of water, the sulphuric acid combines with the water, eliminating the carbonic acid and oxide in the gaseous state. To absorb the carbonic acid, the whole was passed through lime-water, previous to being admitted into the vessel containing the iron and water. In the course of a short time, the water began to assume a greenish appearance: this increased as the process continued, until it arrived at a bright transparent green colour; by this time the oxalic acid being decomposed, and no more gas being eliminated, the pipes were unluted, and the product submitted to the following tests:—

Some of the liquor, evaporated, gave crystalline prisms of a greenish color, which were decomposed in the air, a reddish brown efflorescence forming on the surface. Some carbonate of soda being added to a portion of the solution, a brisk effervescence ensued on stirring it, and a precipitate was formed, which, when dried, was of a brown red cast. The solution of soda, on being evaporated, gave crystals of a rhomboidal form; these, decomposed by sulphuric acid, and the liquor distilled, gave an acid liquor, the vapour of which corroded a plate of lead, forming a white crust on the surface. This crust, when pounded in a mortar, and dilute nitric acid poured upon it, was dissolved with effervescence of carbonic acid, proving that substance to be carbonate of lead, and the acid the acetic. Some of the crystals when decomposed by pouring sulphuric acid slowly upon them, aided by heat, gave off pungent vapours of acetic acid. The acid liquor likewise dissolved oxide of lead, oxide of zinc, and carbonate of copper, the latter attended with effervescence; but neither of the metals were affected by it when immersed in it, although lead when dipped in it and exposed to the air, was gradually corroded. Under all the circumstances, there can be no hesitation in pronouncing the substance in question to be acetic acid.

The theory of this process I imagine to be as follows:—water is decomposed, the hydrogen uniting with the carbonic oxide to form acetic acid, while the oxygen combines with the iron, forming oxide, when one atom of oxide of iron saturates one atom of acetic acid,—thus producing acetate of iron, as shown in the diagram below:—

4 equivalents of carbonic oxide, 14 × 4	1 oxygen	8		
	1 oxygen	8		
	1 oxygen	8		
	1 oxygen	8		
	1 carbon	6		
	1 carbon	6		
	1 carbon	6	51, or 1 equivt. of acetic acid.	9, or 1 equivalent of water.
	1 carbon	6		
4 equivalents of water, 9 × 4.	1 hydrogen	1		
	1 hydrogen	1		
	1 hydrogen	1		
	1 hydrogen	1		
	1 oxygen	8		
	1 oxygen	8		
	1 oxygen	8		36, or 1 equivalent of oxide of iron.
	1 oxygen	8		
	1 iron ..	28		

the last three equivalents of oxygen, combining with three equivalents of iron, to form oxide of iron, which remains undissolved; making the product of the decomposition of water by carbonic oxide, one equivalent of acetate of iron, and three equivalents of oxide of iron.

Although in my experiment I procured the carbonic oxide from oxalic acid, still I prefer as the cheaper mode, and better adapted to a large scale, the production of it from carbonate of lime and charcoal; the oxalic acid being better adapted to the apparatus I possessed, was the cause of its substitution.

The action of cyanogen, as given by Matteuci, on water and metallic copper, I should imagine operated in a somewhat similar manner. Cyanogen being composed of two atoms of carbon, and one atom of nitrogen, two atoms of cyanogen are decomposed, their carbon uniting with three atoms of water to form acetic acid, while their nitrogen decomposes six atoms of water, the hydrogen combines with the nitrogen, forming two atoms of ammonia, while the oxygen combines with the copper forming oxide, which saturates the acetic acid, forming acetate of copper.

M. Guerin advances, that carbonic oxide, like chlorine, is capable of forming an acid, by combining with either hydrogen or oxygen; in the first case acetic is the result, in the latter the carbonic acid. Thus the matter stands at present, but as the science of chemistry advances, I doubt not means will be found of producing this as well as other acids, directly from their elementary gases, without the intervention of any saturating body.

M. DAGUERRE'S LATEST IMPROVEMENT.*

The powers of the Daguerréotype have hitherto been limited to the representation of "still life." Any attempt to pourtray objects in a state of motion, has always been a failure. If the object was moving with much rapidity, no trace was left upon the picture; if the motion was slower, a slurred and blotted appearance was presented, arising from an imperfect representation of the moving body being spread over the path travelled. M. Daguerre recently informed Sir John Robison that he had nearly completed an improved process, by which the Daguerréotype will be capable of receiving instantaneously the impression of any objects presented to it. Invested with this splendid power, the instrument will become altogether unrivalled; it will only have to be presented to the stage of a theatre, the bustling street of a city, &c., when an accurate picture of things as they are in motion at the precise moment, will be obtained. With equal facility we may thus procure faithful portraitures of the most striking dramatic representation—all the pomp and circumstance of war as developed in mimicry at reviews—the vehement debates in the senate house—the marriage of a Queen—or the rejoicing of her subjects—all which may thus be represented with a fidelity and force of which the pencil of the most skilful artist can never become susceptible.

* *Mechanic's Magazine*, No. 880.

GAMBOGE, AS A PIGMENT.†

BY MR. H. DIRCKS.

Gamboge, as imported into this country, from the East Indies, is usually in fragments, cakes, or short rolls; this latter form it derives from being cast in reeds, such as the bamboo. Though a vegetable product, it is not clearly ascertained either from what tree it is obtained, or by what mode it is procured; whether by incision, pressure, or by natural

† From a paper read before the Polytechnic Society of Liverpool, June 11, 1840.

exudation. It is a gum resin, and, in its dry state, it is of a dark orange colour throughout, moderately heavy, breaking readily, with a glossy, and somewhat resinous fracture. It often appears in masses, produced by smaller pieces which have conglomerated simply by the influence of a warm atmosphere. Pieces of gamboge are found to vary considerably in clearness and purity, some having a darker, greener shade than others, and some, too, breaking with a shorter, glossy fracture, exhibiting a shining red resinous appearance.

As a pigment, gamboge is of some durability in water colours. It is also used as medicine, being found to act as a powerful cathartic. Its chemical composition has been variously stated to be attributable to the presence of a variable quantity of its principal constituents, the gum and resin, or foreign vegetable matter. According to Braconnot, there are, in 100 parts, 20 of gum to 80 of resin, that is in the ratio of 1 to 4. Dr. Christison,* *British Annals of Medicine*, gives the following result of his analysis of three varieties :—

	Cake.		*Lump.*		*Coarse.*	
	1	2	1	2	1	2
Resin ..	74 2	71 6	64 3	65 9	61 4	35 0
Arabian	21 8	24	20 7	19 7	17 2	14 2
Moisture	4 8	4 8	4	4 2	7 2	10 6
Lignin .	trace	trace	4 4	6 2	7 8	22
Starch .	——	——	6 2	5	7 8	19 0
	100 8	100 4	99 6	100 1	101 4	100 8

Dr. Thomson alludes to its being dissolved in alkalies, and being converted, by nitric acid, into a yellowish, bitter matter; also, that chlorine deprives it of its dark colour, a combination taking place between it and muriatic acid, which latter it neutralises.

In its dry, solid state, though of a very dark colour, it soon shows a pale, yellow tint when dipped in water, in which, when ground very fine, it affords a turbid, lemon yellow emulsion. In this aqueous preparation it is long before any portion of the gamboge subsides; indeed, no absolute colouring matter is deposited, even when only a few grains are diffused through a quart of water. When the emulsion is of a creamy consistence, if a drop of this be allowed to fall on the surface of water in a tall, cylindrical glass vessel, it will, owing to its viscid nature, occasion a beautiful appearance in its descent, not unlike an inverted flower stem.

Gamboge readily dissolves in spirit of wine, affording a bright, deep orange red tincture, which gives to paper a yellow stain. Applied dry to hot marble, gamboge has been found to impart to it a clear, yellow colour.

A substance is known to artists, by the name of "extract of gamboge;" this is nothing more than gamboge precipitated from its spirituous solution, by adding a little water. If too much water is added to the saturated spirituous solution, the action of the spirit of wine is overpowered, and the common aqueous emulsion is formed. When carefully managed, an opaque yellow precipitate results, which must be allowed to settle; it will then be requisite to draw off the supernatant liquor, and, with a spatula, to remove the layer of greenish gum above the gamboge, from which, when freed, there is obtained a powder, much lighter in colour than the original gamboge, capable of being prepared in oil as a glazing colour. This method is that usually recommended and adopted.

Another process, and one which I have found to be expeditious and certain, is conducted as follows :—

Prepare a mixture of gamboge in water; add strong liquid ammonia, or caustic soda in solution; do this gradually, shaking the mixture each time until the whole changes from a turbid yellow to a beautiful rose-red colour. If an acid be now added, precipitation takes place; pour in muriatic acid at intervals, until the red colour disappears, and is replaced by a curdy, yellow precipitate; now wash in plenty of water, collecting the precipitate on a filter of blotting paper.

Heated on glass, over a spirit lamp, gamboge melts, swells, and carbonises. If heated without burning it does not lose its property of dissolving, in either spirits of wine or alkalies. A piece of glass made hot, then rubbed over with a stick of gamboge, acquires a thin, transparent coating of a golden yellow colour. It dissolves by heat in spirits of turpentine very partially: the tincture gives a peculiarly equable yellow stain to paper. Boiling in plain water has no effect on gamboge; the addition of alum, with a little sulphuric acid to the hot liquor, occasions a partial precipitate in a few days.

Gamboge certainly does not contain any colouring matter which can be procured apart from gum or resin. The precipitate, however obtained, is no more than a deeply-coloured resin, and as such, its value as an oil-colour is exceedingly doubtful. Field, in his Chromatography, speaking of this interesting substance, observes,—"Sir Joshua Reynolds and Wilson are said to have employed it, and so, also we know, did the amiable President, West; the first of these used it softened into a paste with water, and the latter in a dry state, precipitated upon whitening. It has also been employed as a yellow lake, prepared upon an aluminous base; but a much better way than either is,

† See Thomson's Organic Chemistry.

to dissolve it into a paste in water, mix it with lemon-yellow, with which pigment being diffused it goes readily into oil or varnish." And again, treating of his lemon yellow, prepared from platina (but latterly from barium), he says, "In water it exceeds gamboge in brightness, and in mixture therewith improves its beauty. The mixture, also, goes readily into oil; indeed, it is the best and easiest way of rendering gamboge diffusible as an oil-colour—simple solution of the gamboge in little water, and trituration of the lemon-yellow therewith, being all that is requisite for this purpose." In his remarks on white lead he states it to have an injurious effect on gamboge.

We have thus briefly detailed the nature and properties of this curious gum-resin, as far as it is at present known. With the artist it is an object to render it miscible in oil, which, without preparation, is not easily effected. Some doubt its permanence, attributing to it a liability to darken, like the original substance, to an orange tint; but we have seen it unaffected in the admirable works of Wilson. It is a substance of no very extensive use in the arts beyond being sometimes used in lacquering, and by the gilders, in colouring their size.

KALSOMINE.*

A new and inodorous sort of paint, the invention of Miss Fanny Corbaux, has been lately introduced to public notice. The materials of which it is composed are at first soluble in water; and while in this state admit of the design being effaced, or a portion of the colouring of a wall or ceiling being removed, if necessary; a subsequent operation renders the paint insoluble, by a chemical change of the properties of the material, which fixes the colour durably. It is free from any offensive smell, dries in a few hours, is not acted upon injuriously by atmospheric influences, and is said to be more durable than oil paint, as well as more agreeable to the eye, and not at all prejudicial to the health; indeed a room painted with it one day, may be inhabited the next. It may also be made applicable to easel painting also. We have seen a little landscape painted with this material, which combined something of the depth and solidity of oil with the transparency of water-colour; and a specimen of broad flower painting, for a room, was shown, which possessed remarkable purity of tone, and a brilliancy of effect superior to any ornamental painting we have seen, and which resisted the rude action of the scrubbing-brush. The effect of the white as a ground for gilding is extremely clear, without being dazzling; and we can well understand that it possesses the property ascribed to it of "softening and diffusing light."

* From *The Athenæum*, No. 660.

FRENCH COINAGE.†

The *Moniteur* states that the preliminary experiments for the new coinage in copper continue to be made under the direction of Baron Thénard. The Minister having prescribed that an essay should be made of casting bars of perfectly regular dimensions, and free from all oxidation, composed of 90 to 96 parts copper, and 10 to 4 parts pewter, an experiment for that purpose has been made with cast iron moulds, and has been perfectly successful. By this method the new money will be free from all oxide, and the operation will be conducted with greater economy, on account of the cast-iron moulds being able to be worked, as they are in the Mint of London, by machinery.

EXTRACTION OF INDIGO FROM THE POLYGONUM.‡

BY M. OSMIN HERVY.

The solution of the question proposed by the *Société de Pharmacie*, was pointed out as being required to be both theoretical and practical: the competitors, in giving a better process for extracting indigo from the polygonum than any hitherto known, were to indicate its state in the leaves of that plant, and the real quantities which they contain.

M. Osmin Hervy has entered on the subject with method and precision: the fresh and entire leaves were successively treated several times, by ether, by alcohol, and by boiling water: the products soluble in these different menstrua were thus obtained, and examined separately with the least possible perturbation, in their constitution. The leaves, reduced to a colourless skeleton, preserving their form and texture, were treated by alkaline solutions, then washed and incinerated. From these experiments M. H. draws the following conclusions:—

1st. That indigotine exists quite formed in the leaf of the polygonum, not free, but combined with the red resin:

2nd. That this normal combination is destroyed by the mineral bases and acids whilst organic acids do not act on it:

3rd. That at the shooting forth of the

† *Mechanics' Magazine*, No. 883.

‡ *Journal des Connaissances Médicales*, June 1840.

leaf, the indigotine is white, but that it becomes blue under the influence of air and light:

4th. That the green leaves contain colourless and blue indigotine, and the more of the latter as they advance in age:

5th. That ether dissolves the normal combination without modifying its composition; whence it results that the ethereal tinctures of the green leaves always precipitate it, even when sheltered from the contact of the air, but the quantity of colouring matter is proportioned to the age of the leaf:

6th. That these tinctures contain also colourless indigotine, since, by contact of the air, they all precipitate of a blue colour with the same intensity:

7th. That when water is substituted for ether, for dissolving the normal combination under the influence of organic matters, indigotine is procured in the white state, without the normal combination being destroyed: the aqueous solutions do not give blue precipitates in contact with the air:

8th. That oxygen acts only in coloring, and consequently in the precipitation of blue indigotine, the solutions in contact with nitrogen, or carbonic acid gas:

9th. That indigo is entirely in the blue state in the dried leaf, not free, but combined with ligneous fibre:

10th. That in the pulp of the fresh leaves indigo is entirely in the blue state; that there also, as in the dried leaves, the indigotine is colored:

11th. That indigo does not exist in the polygonum in the same state as in other plants which contain indigo, since the latter, when dried, readily yield their indigo to water.

Most of M. Hervy's considerations are justified, as we have said, by numerous and authentic experiments: only the commission of prizes considered that the nature of the combination of the red resin and the coloring matter was not sufficiently established; it was of opinion that it might be a peculiar substance, which was divided into two new bodies, under the influence of certain menstrua.

Proceeding to the extraction of indigo, M. Hervy proves that the processes hitherto proposed are defective: those of MM. Berard and Baudrimont, because they give an indigo of excessive hardness and mixed with pectine; that of M. Vilmorin, because it is too expensive: he shows that the use of boiling water diminishes the quantity of coloring matter existing, by fixing a portion of it on the tissue of the leaves.

His process of extraction consists in macerating the leaves, for two hours, in water at 60° C.; the liquid, which is colored of a fine blue by the contact of the air, is decanted, and four grammes of hydrate of lime are added to every pound of leaves employed; it is stirred and allowed to settle, and the precipitate is washed with water acidulated with hydro-chloric acid, in order to dissolve the excess of lime, and is then dried. The short time that the leaves remain in maceration in the water does not allow of much pectine being dissolved, and the indigo obtained is more easily dried, and remains more pliable than that extracted from the polygonum by M. Baudrimont's process, or by that of the colonies.

The production of indigo varies greatly according to the soil, and especially the period of vegetation. The time at which the polygonum contains the most is a little before flowering. The first-gathered leaves also contain more than the second. Under the most favourable circumstances, M. Hervy thinks that the leaves of the polygonum may yield $\frac{1}{200}$ or $\frac{1}{300}$ of their weight, of a fine commercial indigo.

This memoir, which was followed by an excellent note by M. Vilmorin, jun., on the culture of the polygonum, obtained a prize of 1000 francs.

MODE OF EXTRACTING INDIGO FROM THE POLYGONUM.*

BY MM. GIRARDIN AND PREISSER.

The following is the process recommended by these chemists, for extracting indigo from the polygonum:—

To put the leaves in a long and narrow tub with a tap at the botton; to pour in water at 30° C., in the proportion of about three times the weight of the leaves; to cover the latter with a wicker hurdle, in order that they may remain completely immersed in the liquid, and to leave the operation to itself until the water has acquired a greenish tint, and its surface presents beautiful rainbow-colored froths *(écumes irisées)*. The liquid is to be very quickly drawn off, gradually compressing the leaves; a hundredth to a hundredth and a half of hydro-chloric is immediately to be poured in, and the liquid is to be passed through a sieve, in order to isolate the green and albuminous matters which float in greenish flakes, in the midst of the acidulated liquid; the filtered liquor is to be stirred for about ten or fifteen minutes, several times, in order to oxygenise the dissolved indigo, and afterwards left to settle for twenty-four hours. The indigo found at the bottom of the vessel must be put on a filter, washed with slightly alkalised boiling water, and afterwards dried at a tempera-

* *Journal des Connaissances Médicales*, June 1840.

ture of from 40 to 50° C. It will be of a beautiful shade, excessively light, and fit for immediate sale.

M. SELLIGUE'S LIGHTING GAS.*

On the occasion of the report concerning M. Selligue's lighting gas (for which see *The Chemist*, No. VII. p. 207), M. Pelletan reminded the Academy of Sciences that he had long since announced that lighting gas owes its illuminating properties to oily vapors accompanying the hydrogen gas. In a Memoir read to the Academy, on the 9th of December, 1816, he thus expresses himself:—

"Expecting that my work may be made public, I am in a situation to announce, that the gas procured from wood, coal, or from any animal or vegetable matter whatever, owes its properties of burning with a white flame exclusively to the presence of a certain quantity of oil, dissolved in the hydrogen; that carbon, in whatever manner and in whatever proportion it is combined with the hydrogen, gives only a red and not very luminous flame; and finally, that the flame of hydrogen gas is much more luminous when it dissolves, and retains a greater quantity of any oil."

In another part of that Memoir, M. Pelletan explains in detail the facts of the decomposition of water on red-hot coals, and of the solution of oil in the gases formed, as well as the method of extracting the oil to be afterwards used for making gas luminous; thus furnishing, not only the principles, but also the processes which have since been successfully employed by M. Selligue.

ENGRAVING FROM PHOTOGRAPHIC IMAGES.†

BY M. DONNE.

"After having ascertained," says M. D., "1st, that the yellow layer, produced on the face of the silver by the vapour of iodine, was really formed of iodide of silver; 2nd, that light, or rather the chemical rays accompanying it, acted on this layer by modifying its adherence with the silver, in such sort that this adherence is found more or less diminished, according as the action of the light on the different parts of the layer of iodide is stronger or weaker; 3rd, that the mercurial vapor, to which the plate, after it is taken from the camera obscura, is exposed, touching the silver in all the points not guarded by the layer of iodine, was amalgamated with it, and thus caused the appearance of the image; 4th, that this action once produced, the layer of iodine having served as a momentary covering, which should be penetrated only in the parts acted on by the light, was dissolved and removed by a solution of hyposulphite of soda, and by washing in water; 5th, that the photographic image resulted from a more or less condensed amalgam of mercury and silver, forming light parts and demi-tints, and bare surfaces producing shades, like pieces of ice which reflect black;—I thought it might be possible to find some chemical agent able to attack the bare parts of the silver, sparing the light parts formed by the amalgam of that metal with mercury."

The first care to be taken is in the selection of plates. In the first place, it is necessary that the silver leaf, with which the copper is covered, should not be too thin. The plates should be as beautiful and as pure as possible, without cracks or bubbles, very well polished, and of a perfectly homogeneous grain. Having obtained a plate possessed of all these qualities, the image should be executed by the ordinary daguerréotype process, and as perfectly as possible, the engraving minutely copying all the details of the picture with their good qualities and defects. It is washed with a solution of hyposulphite of soda, very dilute, in order to remove nothing more than the layer of iodide of silver. The plate being well dried, its edges must be covered with a layer of engraver's varnish, so as to avoid the contact of the mordant with the copper, and the drawing is to be put in a frame. It is laid on a basin, on the edges of which it rests by its four corners. On its surface is poured, so as to cover with a very thin layer all the parts not protected by the varnish, nitric acid, diluted in the proportions of three parts of acid to four of water: this must be strictly adhered to. This mordant is the only one with which M. Donné was enabled to succeed. In three or four minutes, the action commences, first, by the appearance of small bubbles of gas, which soon extend all over the plate in contact with the liquid. It is difficult to say how long the action of the acid should be continued, but as it is very rapid it should not be kept up more than two or three minutes. When the plate is sufficiently acted on, the acid liquid is allowed to run into the basin; it is washed with a great quantity of water, and very gently wiped with very fine cotton; the operation is then terminated. It is then necessary to confide the plate to a careful and skilful copperplate engraver, to take impressions of it by the ordinary process, being as careful as possible with the metal, which is always very delicate, and the engraving of

* *Compte Rendue de l'Academie des Sciences*, No. 24.

† *L'Institut*. No. 339, June 25, 1840.

which is not very deep, as may readily be conceived.

M. Donné could succeed in obtaining only forty engravings with photogenic plates, thus engraved. He is of opinion that this might be applied to copying daguerréotype images on lithographic stone, but he has not yet succeeded in doing so.

APPLICATION OF PHOTOGRAPHY TO METEOROLOGY.*

BY H. HUBERT.

It is sufficient to collect on a disc, or on a turning cylinder, covered with a sheet of metal or paper prepared for receiving the impression of light, the projection of the inferior extremity of a hygrometer, &c. For that purpose is placed in a sheath with two linear parallel slits, diametrically opposite, the stem of a thermometer or of a barometer, or the weight of a hygrometer (the latter, in this case, should be stretched out and lightly suspended): the sheath is afterwards disposed before a cylindrical envelope, pierced also in the direction of its edge with a linear slit, which may at will be opened or shut by a languet (care must be taken that the three slits correspond): under the envelope is placed the turning cylinder we have spoken of, the diameter of which should be nearly the same as that of the envelope: light throws on this cylinder, through the three slits, the extremity of the column of mercury of the barometer, or of the thermometer, or the lower extremity of the weight of the hygrometer. This cylinder, in turning round on its axis, presents, successively, each of its sides to the impression of light, which traces on its surface a line whose ordinates, reckoned according to each side, represent the indications of the instrument used in the experiment, and the abscissæ measured on the circumference of the base, give the hour of these indications. In each experiment the collecting cylinder, which is moved by a clock, should not make more than one entire revolution round its axis.

There may likewise be found, for each of these meteorological instruments, means of employing photography for registering their indications.

* *L'Institut*, No. 336.

APPARATUS FOR ESTIMATING THE QUANTITY OF GAS DISENGAGED DURING A CHEMICAL OPERATION.†

M. Persoz exhibited to the *Société Philomatique de Paris*, at its sitting of the 8th of April, 1840, the drawing of an apparatus, which might be used for estimating the quantity of gas disengaged during a chemical operation, when the gas forms a very considerable volume, as, for example, from 4 quarts to 4½. The new apparatus is composed of a little bell, intended for estimating the gas before the experiment, and of a cylinder communicating with this bell, and terminated by another very narrow tube, which is used for measuring the gas when the experiment is concluded. The inventor explained the inconveniences which the former apparatus presented, and which he wished to remedy.

M. Despretz claimed for himself, the first idea of this apparatus: he declared that, in the experiments which he made in order to analyze the air at the time of the cholera, he employed likewise a cylinder terminating in a very fine glass tube.

M. Persoz replied, that the first apparatus of this kind which he had constructed, was before that time, and that it still existed in the *Collége de France*.

ON THE INCONVENIENCES OF CHLORINE IN BLEACHING PAPER.‡

BY M. COULIER.

This reagent possesses an element of destruction which it is important to take notice of. M. Coulier announces that he has proved, by numerous experiments, that paper, whose paste has been bleached by chlorine, however well washed it may have been, possesses elements of destruction, which, after a few years, must render it brittle, and may, in less than a century, reduce it to powder.

M. Gannal remarked the same inconveniences of bleaching by chlorine years ago.

† *L'Institut*, No. 331.
‡ *L'Institut*, No. 327.

III. PHARMACY, &c.

ON THE SALE OF POISONS.

To the Editors of The Chemist.

GENTLEMEN,—The hints given by your correspondent "J. T.," in the last number of *The Chemist*, on the Sale of Poisons, are worthy of serious consideration, inasmuch as the subject is one of paramount importance, affecting as it does both public and private interests. The sale of poisons by persons ignorant of their danger, properties, and use, ought to be suppressed, and none should be allowed to sell them but such as are competently acquainted with them. The practice of requiring the presence of a witness ought to be STRICTLY followed; but it is lamentably and criminally neglected to a very great degree: hence the many deaths arising from mistake as well as suicide.

During an experience of nearly 12 years in the drug trade, I have often met with individuals who, wanting small quantities of poisons, such as arsenic, sublimates, cantharides, and various others equally dangerous, without being accompanied by a competent witness; and on my refusal to serve them with such dangerous drugs,—it being my constant practice never to allow any of such articles to go out of my shop except through my own hands, and, with but very few exceptions, their being accompanied by a witness, on the ground of their dangerous nature,—I have received for a reply, "I can get them elsewhere without so much trouble," and they have done so, in some cases from equally respectable establishments, but more frequently from persons totally unfit to be entrusted with the sale of such dangerous drugs, without any inquiry as to the intended use, often without a proper degree of discrimination.

How often have families been plunged into the deepest distress from suicide, through poisons being sold with a criminal want of caution? A case very recently occurred where an old woman sold T. Opii for T. Rhœi, and consequently the person who took it lost his life; and more recently, in a large midland county town, a melancholy instance occurred to a young female, who purchased arsenic of an individual who, on examination before the coroner, was found totally ignorant of its dangerous properties and of his own moral responsibility. The daily occurrence of such instances, causing a large amount of human life to be sacrificed, through ignorance and cupidity, demands that some preventive measures should be speedily brought into use.

Hoping that some of your numerous and intelligent correspondents will bring the matter to some bearing, and draw the attention of the trade generally to it, and pleading the vast importance of the subject as an apology for so lengthy a communication, I remain,

Yours respectfully,

A PROVINCIAL CHEMIST AND
July, 1840. DRUGGIST.

[We wish that the practice of "A Provincial Chemist and Druggist" were more generally adopted and adhered to. In our opinion, it would tend greatly to diminish the sad sacrifice of human life so often occurring through the ignorance or negligence of the vender.

In addition to the above letter, we have received one from a correspondent signing himself "A Subscriber," ridiculing the suggestions of "J. T." given in our last number. "A Subscriber" says, "it would be utterly impossible to *do away* with the sale of poisons to the extent desired by J. T." He says also, "it would be as well to introduce into the Medical Reform Bill a clause prohibiting cutlers from selling razors, lest the purchaser should meditate cutting his throat,—as one preventing chemists from selling poisons." This is nonsense. "J. T." never contemplated the *prevention* of the sale of poisonous articles; he merely suggested that no party should be supplied with them unless accompanied by a person to witness the transaction. Moreover, there is a great difference between the sale of razors and that of poisons. A razor is an instrument whose use and nature every one is acquainted with: when a man buys a razor, it is assumed, as a matter of course, that he intends to shave himself with it;—when, on the contrary, he purchases a poisonous article, some doubt must naturally arise in the mind of the vender as to its intended use; indeed, it might very reasonably be suspected that the purchaser had some improper motive in view, such as suicide or murder.

Our correspondent is also mistaken in supposing that "J. T." would have these restrictions confined to druggists; his suggestions extend to all who sell poisonous articles.

The subject is one of the utmost importance; it is also, we admit, one of great dif-

ficulty. The present loose mode of selling deadly poisons is truly frightful.]

MEDICAL REFORM AS RELATES TO DRUGGISTS.—PRACTICE OF "TICKETING" RESORTED TO BY SURGEONS.—PER CENTAGE SYSTEM.

In all legislative measures for improving the ill-regulated state of the different departments of medical practice, great care has been taken to give every advantage to the surgeon and the apothecary, and particularly to secure him against any injury from the chemist and druggist. This, doubtless, is quite proper; but, at the same time, even-handed justice is due alike to both, and we do hope that in the new Medical Reform measure, which, it must be confessed, is a very long time in legislative gestation, the interest of the druggist will also be equally protected against any encroachments of the profession or their rights.

If this bill is totally to exclude chemists and druggists from prescribing medicine, or in any way interfering in medical or surgical practice, it is the duty of the Legislature to prevent surgeons and apothecaries from retailing medicines and drugs, except those which they individually prescribe, and from dispensing prescriptions, and certainly, in all cases, from keeping open chemists' shops. This will be an act of justice to the one, and will have the effect of increasing the respectability of the other.

It is quite clear that in the earlier period of medical practice the apothecary was, what the druggist now is,—that he only sold, and did not prescribe medicine.*

That it is high time proper restrictions should be put on this pernicious system, no one can for a moment attempt to doubt or deny: especially when we take into consideration that it is carried to the most unfair and degrading extent, and that the same low-minded and puffing mode of getting "custom" is adopted, as is resorted to only by the very lowest orders of shoemakers, butchers, haberdashers, &c. &c.: we allude to the disgraceful practice of "TICKETING." Several instances of this have lately come under our notice. At a shop lately opened in Goswell road, by a person styling himself "SURGEON AND ACCOUCHEUR," medicines may be seen with their prices ticketed up at one-half lower than they can be sold by others, and this (if we may credit the announcement over his door) by a "REGULAR SURGEON." There is also another ticketing shop near Smithfield, besides others too numerous to mention. We warn these parties, and others of the same stamp, that our eye is on them, their method of doing business, and the quality of their drugs; and we dismiss them for the present with, by way of admonition, a recommendation speedily to reform their practice. We will not at present mention names, (of which we are already in possession,) hoping that they will render such a proceeding unnecessary. We beg to caution our readers, and the public generally, against purchasing drugs at shops where such practice is adopted, as they will not only be sure to obtain the worst possible articles, but will also be countenancing a system, disgraceful in any trade, and subversive of its best interests.

There is as little room for the HIGHEST branches of the profession to complain of the druggists; for it is well known that some of the FIRST physicians and surgeons—even those with the highest titles that can be bestowed on medical men, some of the attendants on ROYALTY—take a regular "per centage" from the druggist on every prescription they send him.

These facts,—and that they are facts not a doubt can exist,—demand immediate correction: all complaints against quackery and imposture proceed with a very bad grace from a profession teeming, in every grade, with the most disgusting practices, flagrant abuses, and sordid cupidity.

It will indeed be a Herculean task to restore to respectability a profession so sunk in degradation, and so replete with abuses; and we hope that those to whom the framing of the new Medical Reform Bill is entrusted, will "put their hands to the plough," and that no means will be wanting, or suggestions neglected, which are in any way calculated to effect an object of such vital importance to the profession and to society.

EXEMPTION OF CHEMISTS FROM SERVING ON JURIES.

To the Editors of The Chemist.

GENTLEMEN,—It was with great pleasure that I read Mr. Gallard's very sensible letter on the necessity of chemists being exempted from serving on Juries, and from any State service. It is unquestionably of as much importance to the public safety that they should not be required to perform such duties, as it is that the other branches of the profession should be exempted from them. And this is not only

* His name warrants this conclusion, for the word is derived from *apotheca*, (απο and τιθημι,) Anglice, an apothecary, "quod pharmaca sua tanquam in apotheois reponat."

the unanimous opinion of chemists themselves, but also that of the higher branches of the profession, and of the public generally. Your excellent advice, to appeal to the Legislature on the subject, ought to be immediately attended to; there cannot be a better time than the present—just prior to a Medical Reform measure being discussed by the House of Commons.

I do most earnestly hope, therefore, that you, or some of your talented correspondents, who are far better qualified for the task than myself, will forthwith draw up a PETITION, judiciously worded, and publish the same in your valuable Journal, with a recommendation that it be adopted in EVERY TOWN in England, and as many signatures as possible obtained to each, and that they be then confided to some M.P. favourable to our cause. Such an appeal, I think with you, could not fail to prove successful; and if such should be the result, you, Gentlemen, will have the satisfaction of knowing, that through the instrumentality of your Journal this important object will have been attained.—I am, Gentlemen, with the greatest respect,

Your obedient humble servant,

ANTHONY MAYHEW,
Chemist and Druggist.

Waltham Abbey, July 7, 1840.

[We concur with Mr. Mayhew as to the measures to be adopted for securing so important a desideratum as the exemption of druggists from serving on juries, and we will cheerfully lend our assistance to it. Our columns are at all times open to anything tending in any way to alleviate or remove the disadvantages under which this highly important branch of the medical profession at present lies.]

TREATMENT OF ULCERS, &c., BY DILUTE CHROMIC ACID.

BY CHARLES WATT.

Having for many years had extensive opportunities of observing the very powerful action of chromic acid in preventing and stopping the progress of putrefaction in inanimate matter, I was induced to try its effects on foul and fœtid ulcers,—and with very decided success.

The mode I adopted to obtain the chromic acid was as follows:—I took one ounce of the bichromate of potassa in powder, and having dissolved it in six parts of boiling water, I then added about three drachms of sulphuric acid and saturated any superabundant acid with common chalk, till the liquid gave no signs of sulphuric acid upon being tested with chloride of barium. When the liquid had stood to become clear I poured it off gently, and then added about six ounces of water, when it was fit for use.

I first of all tried it on some very foul old ulcers of the legs, which had proved very obstinate under all previous modes of treatment. After a few dressings with the dilute chromic acid they soon put on healthy appearances, secreting a thicker pus free from fœtor, and having granulations which at length filled up the cavity of the sores, which then healed.

In many cases I found it of great service as a wash for foul venereal sores; they soon became clean and healthy. In these cases the applications were made in the following manner:—a piece of lint of the size of the sore was dipped into the solution, and then placed upon the whole surface of the ulcer, and over it another piece of lint spread with spermaceti ointment. I likewise employed it in several cases of scrofula, in which, as an application I found it very beneficial. In cancer also it gave very great relief, from the distressing pain, and prevented the fœtid discharge, which is so constant an attendant on this dreadful malady.

As an injection, when very dilute, in gonorrhœa its effects were equally beneficial.

The repeated trials which I gave it in the above mentioned cases, and the uniform benefit which I found to be derived from it, have induced me to call the attention of the profession to its use. Having long since relinquished medical practice I have not now the opportunity of extending my observations. I therefore leave the farther prosecution of the subject to those whose avocation and turn of mind may lead them to pursue it, and I shall feel sufficiently satisfied and rewarded if by this slight sketch. I should be the means of producing a beneficial result.

NEW REMEDY FOR TETANUS AND OTHER CONVULSIVE DISORDERS.*

BY W. B. O'SHAUGHNESSY, M.D., CALCUTTA.

The narcotic and intoxicating effects of hemp are popularly known in various parts of Asia, Africa, and America, where it is extensively employed in a multitude of affections; but in Western Europe the use of hemp is unknown either as a stimulant or as a remedy, probably because the European hemp does not contain any of the resinous matter upon which its therapeutical properties depend. In warm climates, and during certain seasons, a resinous juice exudes and concretes on the leaves, slender stems, and flowers of the hemp. This resin has a fra-

* *British and Foreign Medical Review.*

grant, narcotic odour; bitter, acrid taste; and, when pure, is of a blackish grey color. It is very soluble in alcohol, or fixed oils, and is insoluble in acids.

Having determined, by experiments on carnivorous animals, that the remedy might be administered with safety to the human subject, Dr. O'Shaughnessy proceeded to try its effects in several convulsive diseases. The resinous *extract* which he employed, was obtained by boiling the tops of the dried hemp plant in spirit (sp. gr. 835), until the resin was dissolved, and then evaporating the tincture to dryness. The tincture of hemp was prepared by dissolving three grains of this extract in one drachm of proof spirit. The doses vary according to the disease for the cure of which the remedy may be employed. In cholera, Dr. O'Shaughnessy gives ten drops of the tincture every half hour, until the vomiting and purging are allayed. In cases of tetanus, a drachm of the tincture every half hour, until the paroxysms cease, or catalepsy is induced. In hydrophobia, ten or twenty grains of the extract to be chewed by the patient, and repeated according to their effect.

The diseases for which the hemp resin has been administered by Dr. O'Shaughnessy, are rheumatism, cholera, hydrophobia, and tetanus. In the two former complaints the trials hitherto made do not lead to any determinate conclusion. In one undoubted case of hydrophobia the effects of the resin are thus graphically described by Dr. O'Shaughnessy:—

"By his own desire water was brought in a metallic vessel, which he grasped and brought near his lips: never can I forget the indescribable horrors of the paroxysm which ensued. It abated in about three minutes, and morbid thirst still goading the unhappy man, he besought his servant to apply a moistened cloth to his lips. Intelligent and brave, he determinately awaited the contact of the cloth, and for a few seconds, though in appalling agony, permitted some drops to trickle on his tongue; but then ensued a second struggle, which, with a due share of the callousness of my profession, I could not stand by to contemplate. Two grains of hemp resin in a soft pilular mass were ordered every hour; after the third dose he stated that he felt commencing intoxication; he now chatted cheerfully on his case, and displayed great intelligence and experience in the treatment of the very disease with which he was visited. He talked calmly of drinking, but said it was in vain to try, but he could suck an orange; this was brought to him, and he succeeded in swallowing the juice without any difficulty. The hemp was continued till the sixth dose, when he fell asleep, and had some hours' rest. Early the ensuing morning, however, Mr. Siddons, my assistant, was called up to him, and found him in a state of tumultuous agony and excitement. The hemp was again repeated, and again by the third dose the cheering alleviation of the previous day was witnessed. He ate a piece of sugar-cane, and again swallowed the juice; he partook freely of some moistened rice, and permitted a purgative enema to be administered. His pulse was nearly natural, the skin natural in every respect. His countenance was happy.

"Four days thus passed away, the doses of hemp being continued. When he fell asleep, on waking the paroxysms returned, but were again almost immediately assuaged as at first. Meanwhile purgative enemata were employed, and he partook freely of solid food, and once drank water without the least suffering. But about three P. M. of the fifth day he sunk into profound stupor, the breathing slightly stertorous; in this state he continued, and without further struggle, death terminated his sufferings at four A. M., on the 27th November."

In several cases of traumatic tetanus, the power of the remedy was triumphantly exhibited. In the first case, symptoms of tetanus supervened on the employment of a moxa, for the cure of dysentery. Two days after their appearance the case was considered hopeless; and the extract of hemp was administered, in the dose of two or three grains, every third, and then every second hour. The spasms were speedily mitigated, and ceased altogether in eleven days. The dysentery proved fatal, however, seventeen days afterwards. The other cases are thus alluded to by Dr. O'Shaughnessy:—

"The *second case* was that of Chunoo Syce, in whom tetanus supervened on the 11th December, after an injury from the kick of a horse. After an ineffectual trial of turpentine and castor oil in large doses, two-grain doses of hemp resin were given on the 26th November. He consumed in all 134 grains of the resin, and left the hospital cured, on the 28th December.

Third case.—Huroo, a female, ætat. 25, admitted into the Native Hospital, December 16th, had tetanus for the three previous days, the sequel of a cut on the left elbow received a fortnight before. Symptoms violent on admission. Turpentine and castor oil given repeatedly without effect; on the 16th and 17th, three grains of hemp resin were given at bed-time. On the morning of the 18th she was found in a state of complete catalepsy, and remained so until evening, when she became sensible, and a tetanic paroxysm recurred. Hemp resumed, and continued in two-grain doses every fourth hour. From this time till the third hour

tetanic symptoms returned. She subsequently took a grain twice daily till the 8th February, when she left the hospital apparently quite well.

"Mr. O'Brien has since used the hemp resin in five cases, of which four were admitted in a perfectly hopeless state. He employed the remedy in *ten-grain doses* dissolved in spirit. The effect, he describes as almost immediate relaxation of the muscles and interruption of the convulsive tendency. Of Mr. O'Brien's seven cases, four have recovered.

"In the Police Hospital of Calcutta, the late Dr. Bain has used the remedy in three cases of traumatic tetanus; of these, one has died and two recovered.

"A very remarkable case has recently occurred in the practice of my cousin, Mr. Richard O'Shaughnessy. The patient was a Jew, æt. 30, attacked with tetanus during the progress of a sloughing sore of the scrotum, the sequel of a neglected hydrocele. Three-grain doses were used every second hour, with the effect of inducing intoxication and suspending the symptoms. The patient has recovered perfectly, and now enjoys excellent health."

"The preceding facts (says Dr. O'Shaughnessy) seem unequivocally to show, that when given boldly, and in large doses, the resin of hemp is capable of arresting effectually the progress of this formidable disease, and, in a large proportion of cases, of effecting a perfect cure." We trust that some of our hospital physicians will, without delay, procure the remedy which Dr. O'Shaughnessy has thus favourably introduced, and determine how far it may sustain its reputation as a "powerful anti-convulsive" in this country.

FORMULÆ FOR LOZENGES.

BY MR. BARTLETT, CHELSEA.

NITRE LOZENGES.

3 lb. best powdered sugar; 1 lb nitre powder; ½ drachm smalts; thick mucilage q. s.

OPIUM LOZENGES.

4 lb. sugar powdered, common; 3 ij. powdered opium; mucilage q. s. Ft. Troch.

PAREGORIC LOZENGES.

8 lb. sugar powdered, 2nd.; 3 j. drop lake; 1 oz. paregoric; ½ oz. tartaric acid; mucilage q. s.

RED ROSE LOZENGES.

8 lb. sugar powdered, No. 2; 3 j. drop lake; ½ oz. tartaric acid; 4 drops otto rose; mix with mucilage q. s.

ACID ROSE LOZENGES.

8 lb. best powdered sugar; 1½ oz. tartaric acid; 8 drops otto rose; 1 drachm smalts; mucilage q. s. Ft. Troch.

GINGER LOZENGES.

7 lb. powdered sugar, No. 2; 12 oz. best powdered ginger; mucilage q. s. Ft. Lor.

COUGH LOZENGES.

1 lb. Smyth's soft ext. liquorice; 4½ lb. sugar powdered, No. 3; 1½ oz. liquorice powder; 1½ oz. gum tragacanth powder; 1½ oz. starch powder; 2½ oz. gum arabic powder; 75 drops oil of aniseed. Mix and divide in the form of lozenges or pipe.

ERRORS IN Dr. THOMSON'S CONSPECTUS.

To the Editors of The Chemist.

Gentlemen,—It is truly surprising that a person enjoying the reputation Dr. Anthony Todd Thomson does, should forget himself so far as to send forth a book to the public, and dedicate it "To the Juniors of the Medical Profession," without bestowing on it a look, after it comes out of the printer's hands, to correct the numberless errors with which it abounds. I refer to the last edition of his *Conspectus to the Pharmacopœias*—a book of general reference, particularly by the druggist and junior of the profession. It reflects much discredit on the man who is alike careless of his fellow-men's reputation and lives. In the very first article I turned to, I found a mistake; since which I have observed many more, which I subjoin for the information of the readers of your widely circulated Journal, that they may be induced scrupulously to examine all, before venturing to abide by any of his directions for compounding or dispensing.

First, then, in the Conf. Opii. the ʒij P. Tragac. is altogether omitted, and a pint of syrup ordered instead of ℥xvj.

The Conf. Aromatica of the last Pharmacopœia is ordered to be kept in a *dry state*; but Dr. Thomson says No, you must add the *water* in spite of the College.

In the Mistura Ferri Comp. there is but *one drachm* of sacch. pur. ordered instead of *two*. In the Mist. Gent. Comp. ʒij of Inf. Gent. Comp. which should be ℥xij.

In Mist. Guaiaci.—Aq. Cinnam. ʒix for ℥xix.

In Pil. Aloes. Comp.—Aloes Pulv. ʒss for ʒi Pilulæ Galbani Comp. in the wrong place, it ought to be after the Pil. Ferri, to read right in *operation of*.

In the Tinct. Ammoniæ Comp., ounces are ordered for drachms in the *Mastich(es)* and Spirits Wine.

In the Tinct. Aurantii, rectified spirit is ordered for proof!

In Tinct. Camph. Comp., 34 grs. of opium and benzoic acid ordered, instead of 72 grs., and the ʒj ol. anisi left out.

Tinct. Kino, proof, instead of rectified spirit.

Vinum Opii, ʒij Cort. Cinnam. and Caryophyll. ought to be ʒiiss.

In Vin. Antimonii Tart., he orders 24 grs. to a pint of wine, then tells us every ʒj contains two grains Ant. Tart.

The Inf. Pareiræ, he cannot tell you how to make: it is ʒvj of the radix to a pint aquæ.

Liniment. Terebinthinæ, there is ʒiij soap, for ʒij.

With many &c.'s which, with your permission, I will take another opportunity of pointing out.

I remain, Gentlemen,

Your much obliged Servant,

Vauxhall, July 15, 1840. J. H.

ON THE PRESENCE OF COPPER IN THE HUMAN VISCERA.*

BY SIGNOR CATTANEI.

The existence of copper in organic matters has been, as our readers may have remarked, the subject of the investigations of many chemists: Vauquelin, Chevreul, Sarzeau, Bouchardat, Orfila, Devergie, and Hervy. Positive facts seem to demonstrate that this metal exists in animal matters, in appreciable quantity, and that it may be detected by the nitrate.

The presence of copper in the viscera has lately been made the subject of critical remarks by Signor Cattanei, professor of general and pharmaceutical chemistry in the University of Pavia, which were published in the *Annali Universal di Medicinali*, for April 1840.

As these remarks, and the inferences which may be drawn from them, may be useful in medico-legal cases, we give insertion to them:—

In January 1839, having read the communication which M. Devergie had made to the Academy of Medicine of Paris, concerning the natural existence of copper in the human organs, I felt desirous of verifying the facts experimentally, for it was requisite to do so with a thing which would have judicial applications of such vast importance. I therefore associated myself with my colleague, M. Camille Platner, professor of legal medicine, and medical police, and we agreed to operate in concert. One reflection immediately presented itself; this was to ascertain whether the matters which we sought were congenital, that is to say, an elementary and natural part of our tissues, or whether they were accidentally introduced by food cooked in copper vessels, covered with tin, which contains, as is known, a certain portion of lead. We consequently thought it advisable to make our first experiments on the viscera of children, which had but a short time survived birth, and which had been nourished only by the maternal milk.

On the first of February, we procured a stomach and intestinal tube, from the body of a fœtus born at the seventh month, which had lived only two days, and which had taken nothing but its mother's milk, and died of apoplexy.

On the 8th, we received the lungs, heart, and digestive canal of a second fœtus, also born at the seventh month, and which likewise died of apoplexy, two days after birth.

On the 22d, we were furnished with the lungs, intestinal tube, liver, and spleen of a little girl, born at the proper period, who died of hydro-pericarditis twenty-five hours after birth: she was fed entirely on her mother's milk.

The digestive canals of the three infants, the heart and lungs of the second and third, and the liver and spleen of the third, were separately carbonized in Hessian crucibles. We chose this instrument in order to avoid the objection which might have been made, of our obtaining the copper with which the silver might have been alloyed, had we used crucibles of that metal; or of having obtained the lead from the glazing, if we employed porcelain crucibles. The carbonization of the animal matters being quite completed, we proceeded to their incineration. In order to facilitate the latter, which is always tedious and difficult, and I may almost say, incomplete, we used nitric acid to some, and to others, chlorate of potassa, in order to compare the results.

On the ashes which we thus obtained, we poured acetic acid, and aided its solvent action, by heat. An excess of ammonia was added to the liquids, and, by standing, they became perfectly limpid, and were separated from their deposit, by means of decantation. The liquid portion did not present any blue tint, nor did it give the least precipitate by means of the double yellow cyanuret of potassa, nor with hydro-sulphuric acid: iron immersed in it did not show the least trace of copper. We must therefore conclude that these liquids did not contain even the smallest quantity of copper.

We afterwards dissolved in acetic acid the matters which remained from the decantation, and which were separated by means of ammonia. Into each of the liquids obtained and rendered limpid by filteration, we poured iodide of potassium, chromate of potassa, and hydro-sulphuric acid; we also

* *Journal de Chimie Médicale*, July 1840.

put in a sheet of zinc. The only one of these reagents which gave us any suspicion of the existence of lead, was the hydro-sulphuric acid; it gave the liquids a light brown tint. However, in order better to understand the nature of the deposit, we dissolved it in very dilute hydro-chloric acid, and we poured into the liquid a solution of yellow ferrocyanuret of potassium; this gave a blue precipitate, which made us conclude that the brown color of which we have just spoken, depended on sulphuret of iron.

Consequently, we have been obliged to conclude that the viscera which we examined did not contain any trace of copper or lead.*

After this first work, we undertook the analysis of the viscera of adult subjects, in order to ascertain the degree of confidence which might be placed in the results obtained by M. Devergie. We remitted this examination for a few days, when, in the mean while, fell into our hands (April, 1839) the report which MM. Caventou, Pelletier, Dumeril, and Delens had made concerning M. Devergie's work to the Royal Academy of Medicine, at the sitting of the 26th of February, 1839. The Commission having declared that the facts advanced by M. Devergie were not conclusive, we did not think it necessary to go any farther. Our experiments, however, have not been the less important; for, supposing that new investigations should tend to confirm M. Devergie's assertions, the problem relative to the congenital or accidental origin of the metals in question, would be found already in the way of solution, and we understand the medico-legal tendency that such a solution would have.

CHEMICO-LEGAL INVESTIGATIONS CONCERNING MORPHINE.

Iodic acid has been highly spoken of as a means of detecting the presence of morphine, which has the property of deoxygenizing it, and liberating the iodine. The following observations have led Mr. Davidson to deny its utility in this respect:—

Some months ago, in examining the urine of a patient, he discovered that by adding a little iodic acid, it acquired the odour of iodine, and that with starch it assumed a blue tint. He then endeavoured to ascertain which of the elements of urine possessed this property; he tried urea and uric acid, and found that the latter alone possessed it, and might thus be detected as well in the urine of healthy persons, as in that of invalids.

He afterwards tried the effects of iodic acid on the serum of the blood, and obtained similar results, but more slowly: the tint was not so deep as that of the urine of healthy persons.

All the albuminous fluids which he examined, furnished the same results; the only difference was in the intensity of their color. He observed the same facts in the serum of the brain of a man who had died of typhus fever, in the liquid procured by tapping, from a person affected with peritonitis, from a dropsical patient, in the serum of the milk of a heifer, &c. The serum of blood, even when mixed with four or five parts of water, gave, with iodic acid and starch, the same color, and even more beautiful, as when alone.

From these facts it appears that iodic acid is capable of being decomposed by substances which exist in abundance as elements of our food, and as a constituent part of the animal fluids and solids. One of these secretions, urine, contains a substance which produces the same effect. Therefore, in analyzing substances contained in the stomach, in cases of poisoning by morphine or opium, the certainty of finding albumen in it, and the possibility also of meeting with uric acid, can only render the separation of morphine from these two substances difficult and complicated, and even doubtful, for iodic acid can no longer be considered as a test for it.

ON THE MEADOW NARCISSUS, AND ON AN ACTIVE AND VOMITIVE PRINCIPLE, NARCITINE.*

BY DR. JOURDAIN.

It is well known that the meadow narcissum (*narcissus pseudo narcissus*), has lately been the subject of many experiments.

1st. M. Loiseleur Deslonchamps endeavoured to discover the vomitive property of the bulbs and flowers, with the view of employing these indigenous products as substitutes for ipecacuanha; but the therapeutical experiments which he tried, did not permit his proving the presence of a vomitive principle in this plant.

2nd. MM. Avuret and Waltecamp, physicians at Valenciennes, assert that they have successfully employed narcissus flowers in the dose of 12 to 15 decigrammes, for producing vomiting.

3rd. M. Dufresnoy has also asserted that the extract obtained from the flowers had a vomitive action in the dose of from 5 to 15 centigrammes.

4th. M. Caventou, who analyzed this plant, did not detect its vomitive property:

* We have ascertained and proved that the viscera of adults do sometimes contain copper and lead, and that at others they do not. New investigations must be made.

† From the *Journal de Chimie Médicale.*

he perceived by analysis that it was composed of a fatty, odorous matter, of a yellow coloring principle, of gum and of vegetable fibre. M. Charpentier found in it a resin, gallic acid, mucilage, extractive and ligneous matter, and muriate of lime.

Dr. Jourdain attributes the properties of the meadow Narcissus to a peculiar principle, narcitine, whose properties he thus describes:—

This substance is white, sweet, and transparent, with very little taste and smell; it is deliquescent, soluble in water, alcohol, and vinegar. The dried scales (*squames*) of narcissus contain almost half their weight of narcitine. This principle is less abundant in the flowers.; the stem contains a great quantity of it before the development of the flower; when it begins to fade it contains nothing more than a little gum: it is the same with the leaves. It is quite different with the bulb, which is less rich in extractive matter during vegetation: in this principle resides the emetic virtue of the meadow narcissus.

Dr. Jourdain has seen in his experiments, that the peculiar principle, narcitine, exists in the *narcissus poeticus* and *tazetta* in almost the same proportions as in the meadow narcissus. The *narcissus jonquilla* contains a less viscous matter than the above species.

The dried bulb of the meadow narcissus contains in the 100 parts:—

Narcitine	37
Gum	6
Tannin	24
Ligneous matter	28
Saline substances	,,
A volatile oil	,,

The flowers contain but 25 per cent. of narcitine.

Dr. Jourdain's opinion, which coincides with that of MM. Avuret, Waltecamp, and Dufresnoy, in establishing that the active principle of the narcissus is vomitive, is contrary to the facts observed by MM. Loiseleur Deslonchamps, and Caventou; it would, therefore, be useful to resume this subject, and to ascertain whether the narcissus which grows in the department of the Seine is possessed of other properties than that described by the physicians of Valenciennes and Dr. Jourdain.

DETECTION OF THE ADULTERATION OF ESSENTIAL OILS WITH ALCOHOL, BY MEANS OF CHLORIDE OF CALCIUM.*

BY M. BORSARELLI.

The author uses a small cylindrical tube of about three centimetres in diameter, and twelve in height, closed at one end. He fills it to two-thirds with oil, and introduces into it small pieces of chloride of calcium, well dried, and quite free from dust; he then corks the aperture of the tube, heats it to 100° C. for about four or five minutes, in the sand-bath, repeatedly stirring it, and he afterwards allows it to cool slowly.

If the essential oil contain much alcohol, the chloride entirely dissolves, and forms a thick layer at the bottom of the tube, while the oil remains above. If it contain only a very small quantity of alcohol, the pieces of chloride of calcium effloresce, lose their form, and reunite at the bottom of the tube in a white and adherent mass. Finally, when it is quite pure, the pieces of chloride of calcium remain unaltered in their form.

It is well to observe that when it is wished to test an essential oil, a very small quantity of chloride of calcium should at first be employed, and more of it gradually added, lest, if the proportion of alcohol should be very small, it be not absorbed by the chloride, without perceptibly modifying it, and without being able to prove its existence. In all cases it is easy to determine the proportions of a mixture of alcohol and essential oil, by comparing its weight or volume with that of the pure oil which floats on the alcoholic solution of the chloride, when the operation is terminated.

The same process, adds the author, may also be used for ascertaining the quantity of alcohol which ether contains; employing, however, a longer tube, and not quite so accurately corked.

* *Revue Scientifique et Industriel.*

MODE OF DETECTING THE ADULTERATION OF OLIVE-OIL AND OIL OF SWEET ALMONDS, WITH OIL OF POPPIES.†

BY A. LIPOWITZ.

The action of protonitrate of mercury on olive-oil, proposed by M. Poutet, was rejected, because poppy-oil, when acted upon this by salt, undergoes the same modifications. Poppy-oil, mixed with olive-oil, which, beaten together, should throw up bubbles produced by the former, is too empirical and too insufficient an operation: Rousseau's diagometer is too difficult a process.

M. Lipowitz thinks that this adulteration may be detected by means of chloride of lime (C^2 C^2 I O^2).

When 8 parts of the suspected oil are triturated with 1 part of chloride of lime, a short time after being agitated in a cylinder, the mixture, in cases where there is only

† *Journal de Chimie Médicale*, June, 1840.

olive-oil, or oil of almonds, separates into two perfectly distinct layers, the upper of which is pure bleached oil; the lower is the whole mass of chloride of lime with a little oil. In at most four or five hours, and at a temperature of 14-15° R., the mixture is separated into two equal parts, and in eighteen hours the two parts of oil are quite distinct and clear.

When, on the contrary, poppy-oil is triturated with chloride of lime, there is no perceptible separation of the mixture, even after some days. I have profited by this property of these different oils to detect poppy-oil in olive-oil and oil of almonds, and I have found that these oils, adulterated with ⅛ of poppy-oil, show, after one hour, scarcely any separation; it does not commence until it has stood for above six hours, and it is only after eighteen hours that ¼ is found in the oil of almonds and in the olive-oil, half of the volume. A mixture containing more than ⅛ of poppy-oil shows hardly any difference from pure poppy-oil, and it is very long before any separation is perceived. A mixture of equal parts of these oils acts exactly like poppy-oil.

This adulteration is more distinctly detected by adding an equal quantity of water to the above mixture, and the oil of almonds, agitated with chloride of lime and water, is separated into two parts, in which, ten minutes after, the whole quantity of water is found, rather milky, at the bottom, and the upper layer is a mixture of the chloride and oil. The same separation occurs, but less readily with olive-oil; and by frequently agitating, the two mixtures flow easily. Poppy-oil, stirred with chloride of lime, forms, on the contrary, a saponification so solid as to attach to the sides of the vessel. A mixture of oil of almonds and ⅛ of poppy-oil, forms a saponification, the water of which easily flows off, whilst the vessel remains covered with the oily mixture, which does not do so.

BLISTERING TISSUE.

To the Editors of The Chemist.

10th July, 1840.

GENTLEMEN,—As there is a new mode of blistering resorted to, and one which, from its numerous advantages, is likely, when generally known, to supersede the use of the old Emplast. Cantharid., might I take the liberty to enquire whether any of your readers are acquainted with it?

It consists of simply laying a piece of thin paper upon the part, and in the course of twelve hours it acts as a powerful Epispastic, producing much less pain than the common plaster. To appearance, it seems to be tissue paper, which has been dipped in some colourless fluid, and carefully dried. The operation altogether is comparatively so cleanly and pleasant, that most people would, I think, prefer it.

I am practically aware that the acetate of cantharidine, will, in most cases, produce a blister in about half the time usually required by the old plaster; but it is necessary in this instance to moisten a piece of linen, (cut the size required), place upon the part and cover it *immediately* with oiled silk or cloth, to prevent evaporation. Strangury is, I believe, more likely to be produced by rapid blistering, but might in a great measure be obviated by the introduction of opium or of camphor.

I know of only one individual who makes the paper successfully for this new mode of blistering, and which he keeps a great secret. Now, the mystery connected with the subject is, 1st, what solution of cantharidine he employs? 2d, the mode of combination by which he is enabled to impregnate the paper? and 3d, how is the paper preserved so as to retain this preparation in its pristine power?

Answers to the above, from any of your correspondents, will be esteemed a favour, by, Gentlemen, your most obedient servant,

J. M.

[If our correspondent will refer to *The Chemist*, No. II. page 59, he will, we think, find what he wants: common blotting paper may be slightly saturated with the ethereal tract of cantharides. We think it should not be kept long before being used. M. Trousseau used some which had been kept for fifteen days in the open air: he found it very efficient, even at the expiration of that time.]

ON SULPHATE OF COPPER AS A VOMITIVE.*

It is well known that sulphate of copper has lately been employed as a vomitive. A case of poisoning by opium has been published, in which 7½ decigrammes of sulphate of copper, given as an emetic, saved the patient.

Alston and Hahnemann prefer it to emetic. F. Hoffman gave it in broth, in the dose of a decigramme, and even more. Seuter associated it with ipecacuanha. Marjat combined its use with that of emetic.

M. Toulmonche, of Rennes, has lately published a work on this salt, considered as a vomitive, in which he comes to the following conclusions:—

* *Journal de Chimie Médicale*, July 1840.

1st, In the dose of 10 centigrammes (2 grains), sulphate of copper causes vomiting eleven times out of twelve; but the number of vomitings varies only from one to three.

2d, In the dose of 20 centigrammes (4 grains) its action as a vomitive is certain and uniform, since it failed in its effect only four times out of thirty-seven.

3d, In the dose of 30 or 40 centigrammes (6 or 8 grains) it is more certain than stibial tartar, since, in this dose, it has never failed in its effect.

4th, Its administration in these doses is not more dangerous than that of the salt of antimony.

5th, Its purgative action can certainly be depended on to produce it separately (that is to say, without being preceded by vomiting), only in one case out of three; moreover, this salt provokes colics, in general slight, but sometimes more intense, so that it would irritate the intestinal mucus, only in a weaker manner.

ON THE FLOWERS OF KWOSO AND THEIR VERMIFUGE PROPERTIES.*

M. Theodore d'Abbadie, known in the scientific world by various communications to the Academy of Sciences, some months since brought a young negro from Abyssinia, who some time before his departure, felt himself attacked with a tape-worm.

This negro, in consequence of the hurried preparations for the voyage, had been able to furnish himself with but a small quantity of the flowers which in his country are called *kwoso*, and which possess vermifuge properties in a high degree.

When he found himself tormented by the worm, he took ten grammes of these flowers reduced to powder, in a glass of water; some hours afterwards he felt the worm agitated in his stomach, and next day he voided it by stool.

M. d'Abbadie, thinking that this plant might be useful in medicine, requested us to examine it. After having treated the kwoso flowers by water, alcohol, and ether, we found that this plant contains:—

1st. A saccharine matter.

2nd. Starch.

3rd. An extractive vegetable matter.

4th. A green and very odorous resin.

5th. Crystals soluble in water, and in alcohol; these crystals redden turnsole paper.

Having but a very small quantity of these flowers, we regret being unable accurately to ascertain the nature of the crystals obtained.

We hope that, for the good of society, this note will attract the attention of practitioners, and particularly that of MM. Petit and Lefebvre, who at the present time are in Abyssinia, making scientific investigations.

The kwoso flowers are produced by a tree three metres in height; it occurs chiefly in the damper parts of Abyssinia.

M. d'Abbadie thinks that it belongs to the family of malvaceæ: we could not confirm this fact, as the flowers were too much injured.

* *Bulletin de Therapeutique.*

PRIZES PROPOSED.

At the sitting of the *Société de Pharmacie*, M. Bassy, in the name of the committee of prizes, proposed that a prize of 1000 francs be again offered for the discovery of the active matter of Digitalis:

That a similar prize be also offered for the discovery of the active matter of Ergot of Rye.

These propositions were adopted by the Society.

The memoirs, written in French or Latin, must be addressed, post-paid, to M. Soubeiran, secretary to the Society, Rue de l'Arbalete, Paris, before the first of August 1841.

FORMULA FOR THE TREATMENT OF ITCH.

BY RAFFAEL NAPOLI.

R. Chloride of lime.... 500·00

Dilute it with from . 1500·00 to 2000·00

Leave the mixture for two hours.

Afterwards strain the liquid through a cloth, and use it externally.

Compresses are steeped in this water, and are applied to the affected parts. Each compress is covered with a second cloth steeped in strong vinegar. As the cloths dry they are again wetted. This treatment is continued until all the liquid is consumed, when the patient is radically cured. In some cases, though very rarely, the treatment requires to be recommenced.

WALCH'S TONIC ASTRINGENT PILLS IN BLENNORRHŒA AND LEUCORRHŒA.†

R. Venetian Turpentine } āā gram. 8·00
Extract of Gentian }
Sulphate of Iron . } āā ,, 6·00
Kino . . }

F. S. A. pills of one decigramme each.

† *Journal des Connaissances Médicales*, June 1840.

These are very beneficial in blennorrhœa and in chronic leucorrhœa.

Four pills to be taken, three or four times a-day.

ON THE USE, AS FOOD, OF THE FLESH OF ANIMALS WHICH HAVE DIED OF DISEASE.*

Mr. J. C. Albers of Berlin, in the 2nd and 3rd Nos. of Vol. 55 of *Rust's Magazin für die Gesammte Heilwunde*, has endeavoured to prove, from numerous facts related by different authors, and from his own observations, that the flesh of animals labouring under either epizootic or sporadic affections has with impunity been eaten by man: he is of opinion that, in cases where ill effects have been remarked, they are always owing to other circumstances: for instance, he has known individuals die of eating *bad pickled* meat, which had undergone putrid fermentation in the casks in which it had been kept and salted.

SOLUTION OF EXTRACT OF HEMLOCK IN SCROFULOUS OPHTHALMIA.†

The following preparation is recommended by Vop, of Hanau, in cases of scrofulous ophthalmia:—

Extract of hemlock.
Spirituous cinnamon water.
Dissolve.

It is given to children of three or four years of age, and even older, in doses of four drops of this solution, three times a day, adding a drop every day to each dose. Blisters behind the ears, and the use of compresses of tincture of thebaïa are ordered at the same time.

Professor Otto, of Copenhagen, has used this medicine with complete success in more than thirty cases of scrofulous ophthalmia: he has increased the dose to thirty or thirty-five drops, without any injurious results.

BITTER DRAUGHT AGAINST STOMACHIC OLIGOTROPHY.

BY DR. PLISSON.

R. Peruvian bark	.	gram.	10·00
Columbo root, Rhubarb, Aniseed (ā ā)	.	,,	4·00
Wormwood leaves	.	,,	2·00
Calcined magnesia	.	,,	1·50
Common cold water	.	,,	1000·00

Leave in maceration for twelve hours and filter through blotting paper.

Dose: A Bourdeaux wine glassful, three times a day, before the two principal meals.

This is a very agreeable and efficacious preparation in dyspepsia, anorexia, weakness and languor of the stomach.

It may be enquired what part in this composition does the small quantity of magnesia perform, since it is removed by filtration. Dr. Plisson, foreseeing this objection, replies that although the oxide of magnesium is almost insoluble in water, it is, however, partially dissolved in it, particularly the portion which is combined with acids of some of these substances, and with the volatile oils of others, and that in all cases, it is not indifferent to prescribe or not to prescribe it in this formula, seeing that the aqueous liquid is charged with a much greater quantity of extractive matters by aid of this addition.

* *Journal Chimie Médicale*, June 1840.

† *Wochenschrift für die ges. Heilkunde.*

TO CORRESPONDENTS.

NOTA BENE.—*All Communications and Books for Review must be addressed, "To the Editors of The Chemist, care of Mr. Hastings, Publisher, 13, Carey-street, Lincoln's Inn Fields, London." Communications must be pre-paid, and sent before the 15th of each month.*

J. T. will find a method of preparing lactate of iron in "The Chemist," No. V., page 160.

A SUBSCRIBER, Glasgow.—Muriate of Morphia may be formed by the direct action of muriatic acid on anhydrous morphia.

"SCHEELE."—We regret being unable, at present, to give the information required. We will, however, endeavour to obtain it.

W. F. W.—Red ink may be made by boiling two ounces of Brazil wood in a pint of water for fifteen or twenty minutes, and then adding a small quantity of gum and alum. The finest red ink is that prepared by digesting cochineal in a very dilute solution of ammonia.

The kind favour of our correspondent at Tetbury was received just as we had completed our number. It will appear in our next.

Second Editions of Nos. I. II. and III. having been completed, may now be had of our publisher.

STEWART AND MURRAY, PRINTERS, OLD BAILEY.

THE CHEMIST.

I. CHEMISTRY.

THE CHEMISTRY OF MOUNTAINS. THEORY OF THEIR FORMATION.*

BY EDWARD BENTLEY,

Fellow of the Microscopical Society of London, and Operative Chemist to H. R. H. the Duke of Cambridge.

"Omnia mutantur nil interit .....
Nec manet ut fuerat nec formas servat easdem,
Sed tamen ipsa eadem est."

NOTWITHSTANDING the late rapid progress of Geology, it still remains a problem whether the mountains of the earth have been formed by volcanic forces, such as exist at the present time, or by the agency of central fire. The majority of modern geologists, with Monsieur Cordier at their head, have adopted the latter opinion, because it has been found that the temperature of the earth increases in some proportion as we descend below the surface, and that in deep mines, the water issuing from the surrounding strata is from 20° to 30° warmer than that of superficial springs. From such data it has been inferred, that the temperature of the earth augments about 1° for every 45 feet of descent, making 212° at the depth of 12 miles, and increasing in the same ratio to the centre, where everything is in a state of fusion and incandescence, and that all mountains have been upheaved by the expansive force of this immense furnace. But with due deference to the high authorities in support of this hypothesis, I shall venture to offer a few brief observations, with a view of shewing its insufficiency to explain the more important phenomena of Geology.

In the first place, if the mountains of the globe were elevated by the agency of a central fire, they ought to be much higher than they are.

Secondly. All the loftiest mountains of our planet are confined to the tropical regions, and diminish in magnitude on to the polar circles, where their average height is from four to five times less than in equatorial India, Africa, and South America, as may be shewn by reference to the best recent works on physical geography. But if the vast chains that girdle our planet were upraised by a central fire, it is impossible to comprehend "why the polar mountains should not be as high as those of the tropics, for the former are actually nearer the centre of the earth."

Thirdly. It has been supposed by Geologists that the earth originally existed in a state of red-hot fusion throughout, and has ever since been cooling down, because the fossil organic remains of the older sedimentary formations in the northern hemisphere indicate a much higher mean temperature than exists at present. To this hypothesis it may be answered, that a gradual change in the inclination of the earth during long geological epochs, would explain the phenomenon in a more satisfactory manner; and even admitting that we have no actual proof of such a change, the predominance of land in the tropical, and of water in the polar regions, would so far modify the physiological conditions of the globe, as to permit the existence of plants and animals in high latitudes, the representations of which are now found only in the torrid zone, as mentioned by Mr. Lyell. Besides, it is admitted by Fourier, that if the earth had been projected into a medium 58° below zero at any given temperature, it would not cool more in 1,280,000 years than a globe of 1 foot in diameter, composed of the same materials, and placed in like circumstances, would in a second of time.

Fourthly. That the volcanic action by which mountains are elevated is generated

* Communicated by the Author.

by chemical action at no great depths beneath the surface, would appear from the well-known fact, that all the volcanoes now in existence are found to be submarine, or situated in the vicinity of the ocean, and abound with marine salts; which clearly shews that the action of sea-water is indispensable to their activity, and if so, it is evident that they cannot be owing to central fire.

It is also worthy of notice, that volcanoes are far more numerous and active in the tropical than in the middle and higher latitudes: from which we are authorised to conclude, that the subterranean action by which they are generated, like all the chemical and vital transformations on the surface of the globe, is governed by temperature.

The vast importance of mountains in the economy of nature, would appear from a variety of considerations. They are not only the source of rivers, but of the precious metals and gems, which are forced up from the interior portions of the earth to its surface, and placed within the reach of man.

What can be more grand and impressive than the immense chains of granite and porphyry that extend for hundreds and thousands of miles in length, while they modify the directions of winds, the temperature of climates, and seem as the boundaries of nations? Were it not for mountains, the sea would everywhere prevail, causing a gloomy waste of land and water. There could be no rivers or springs, nor any of that beautiful variety of hill and dale that now adorns the surface of the earth, and renders it the delightful abode of sentient beings.

As the composition of organized beings is renewed by the removal of its tissues, by absorption, into the general circulation, so is the surface of the earth perpetually renovated by the disintegration of mountains, which are gradually worn away by the action of running waters, and transported into valleys, lakes and seas, forming new lands. Thus it is, that all the phenomena of meteorology, chemistry, geology, and physiology, are immediately connected with the natural history of mountains.

"Old things pass away, and all things become new."

The air, the ocean, and the earth, are for ever in motion, under the government of wise and beneficent laws, which pervade the whole system of nature in a state of undecaying vigour and youthful beauty.

ON THE DIFFERENT OBSTACLES PRESENTED IN THE EMPLOYMENT OF PHOSPHORUS AS AN EUDIOMETRICAL MEANS.—ACTION OF CARBURET OF SULPHUR, OF CREOSOTE, OF EUPIONE, AND OF SULPHUROUS ACID, ON PHOSPHORUS.*

BY M. VOGEL, JUN.

It is a well known fact that phosphorus melts in chlorine, and that it inflames spontaneously in that gas, and burns in it with a whitish and not very brilliant flame, forming chloride of phosphorus.

Mr. Graham, professor of Chemistry in the London University, first observed that phosphorus lost its property of being luminous, in an atmosphere mixed with a small quantity of chlorine. This phenomenon induced Mr. Graham to examine the action of some other gases on phosphorus, and he obtained many very interesting results. He observed, for example, that in an atmosphere containing olefiant gas, sulphuretted hydrogen, or vapours of ether or oil of turpentine, phosphorus shone very feebly, or even ceased to shine at all, in the dark.

I proposed to myself to repeat Mr. Graham's experiments, and to add, if possible, some new facts to those noticed by that chemist.

Wishing in the first place to determine the quantity of chlorine sufficient to prevent phosphorus from being luminous, I introduced a piece of phosphorus, fixed to the point of a glass tube, into a graduated bell-receiver containing 25 cubic inches of air, and placed over water. While the phosphorus was tranquilly shining in this air at a temperature of 12°·5 C., I added to it 3·5 cubic inches of chlorine. In about a minute, the phosphorus entirely ceased to be luminous in the dark; but when the water had dissolved 1·5 cubic inches of chlorine, and consequently there remained but 2 cubic inches of chlorine mixed with the air, the phosphorus again began to become luminous. From this experiment it results, that phosphorus ceases to be luminous in air composed of 100 volumes of pure air and 8 volumes of chlorine.

When a dry piece of phosphorus is introduced, in an iron spoon, into air mixed with a fifth or sixth of its volume of chlorine, it soon begins to fuse at the temperature of + 8° C. When it is completely melted, it inflames spontaneously, and burns, not with a whitish, feeble, and dull flame, but with a very vivid and brilliant one; at the same time there are formed chloride of phosphorus, red oxide of phosphorus, and phosphoric acid.

* *Journal de Pharmacie*, July, 1840.

According to analogy, it might be conceived that bromine would exert the same influence as chlorine on phosphorus, but experiment has not confirmed this opinion. In a flask of air containing vapours of bromine, phosphorus shines at a temperature of + 10° C. less powerfully, it is true, than in pure air, but the disengagement of light never entirely ceased. If the temperature be increased to + 18 C., the phosphorus melts without inflaming.

ACTION OF CARBURET OF SULPHUR ON PHOSPHORUS.

A piece of phosphorus, which was luminous and surrounded by white vapours, in a bell-receiver full of air, slightly damped and placed over water, ceased to be luminous the moment that a small open vessel containing a drop of carburet of sulphur was passed under the glass.* During the space of four days not the slightest trace of light was observed. The same piece of phosphorus, removed from the atmosphere charged with carburet of sulphur, and placed, without having been washed, in other bell-glasses filled with fresh air, did not begin to become luminous. It might even be left several days in contact with the air, without commencing to be surrounded with white vapour, or to become luminous in the dark. It was only after having been well washed with water, and dried by means of blotting paper, that it acquired the property of being luminous in fresh air.

The smallest quantity of carburet of sulphur is sufficient to produce this effect on phosphorus; for if a drop of it be poured on paper, and if a slip cut from this paper be rapidly introduced under a bell in which phosphorus is disengaging light, this light is completely extinguished.

The influence of carburet of sulphur on the luminosity of phosphorus is so great, that the temperature may be raised until the phosphorus fuses = 35·8 C., and even higher, without the slightest phosphorescence being observable in the dark.

According to these results it must be admitted that carburet of sulphur is one of the fittest substances for preventing the slow combustion of phosphorus.

When a piece of paper is moistened with a solution composed of two parts of phosphorus, and one of carburet of sulphur, the paper does not commence to become luminous for a few minutes, that is to say, the disengagement of light is not manifested until the carburet of sulphur is completely evaporated. This phenomenon results from the evaporation of the liquid causing a great diminution of temperature, which opposes the slow combustion of the phosphorus. Besides, carburet of sulphur itself presents, as we have just seen, a powerful obstacle to this combustion. The phosphorescence of the abovementioned paper, once commenced, gradually increases, until the paper inflames of itself in the air.

A strip of blue turnsole paper steeped in carburet of sulphur charged with phosphorus, and exposed to the air, does not shine immediately; but as soon as phosphorescence commences, the paper becomes red, and, soon after, combustion ensues.

INFLUENCE OF CREOSOTE AND EUPIONE ON PHOSPHORUS.

When a piece of phosphorus is left in a small flask filled with creosote, in a dark place, without elevating the temperature, it is found, at the expiration of 24 hours, that the creosote has dissolved sufficient phosphorus for nitrate of silver to produce in it a black precipitate, and for a piece of paper, damped with it, to shine in the dark. The colorless creosote, kept in a flask, with a piece of phosphorus and a little air, assumes, after a few weeks, a black color, and acquires a thicker consistence. In this state it reddens turnsole paper, and contains a free acid of phosphorus.

When a strip of paper, previously steeped in creosote, is introduced into a flask containing a piece of phosphorus luminous in the dark, without touching the phosphorus, the latter immediately ceases to produce white vapours. With respect to the surrounding light, no diminution in its intensity is at first observed, but at the expiration of about twenty minutes, it begins gradually to diminish, and in an hour it entirely ceases.

Eupione acts on phosphorus in nearly the same manner as creosote does; its action, however, is not so energetic. In order to prevent the slow combustion of phosphorus, by means of eupione, more of it must be employed than of creosote, and it must be allowed to act for nearly double the time.

A piece of phosphorus was kept for several days in a flask containing eupione. During this time, the eupione lost none of its transparency: when decanted, it contained a certain quantity of phosphorus in solution: nitrate of silver formed in it a black precipitate, and a strip of paper steeped in this liquid became luminous in the dark.

INFLUENCE OF SULPHUROUS ACID GAS ON PHOSPHORUS.

When we add to air in which phosphorus shines in the dark, $\frac{1}{2}$ of its volume of sulphurous acid gas, after five minutes the phosphorus entirely loses its luminous state, and, in this mixture, does not resume it.

* All the experiments were made at a temperature of from + 8° to + 10° C.

In turning into water the flask which contains this gaseous mixture and phosphorus, so that the water may gradually enter into it and dissolve the gas, the phosphorus does not recommence to shine feebly until the sulphurous acid gas is completely dissolved. The small quantity of this gas which surrounds the surface of the phosphorus seems to be sufficient to prevent its combustion: it is only after being well washed and dried that it becomes luminous in a fresh quantity of air. It is not even necessary to make sulphurous gas pass into the flask; a small quantity of an aqueous solution of this gas, introduced into a flask containing 100 cubic inches of air, in the midst of which phosphorus is shining, is capable of preventing its combustion. It might be supposed that phosphorus does not burn in an atmosphere impregnated with sulphurous acid gas, because the oxygen has already been absorbed to change the sulphurous into sulphuric acid: but this supposition is unfounded, for on examining the mixture of air and sulphurous acid gas in which phosphorus had ceased burning, I found that the air had lost scarcely any of its oxygen. When the temperature of the phosphorus is raised to + 18° C., in a flask filled with a mixture of air and sulphurous gas, the phosphorus begins to burn, and fuses at this temperature, which is much lower than that of fusion in the air. This phenomenon seems to be analogous to that long ago remarked, that the fusibility of phosphorus is different in nitrogen and in hydrogen gases.

I left a piece of phosphorus in a flask containing liquid sulphurous acid, for the space of three weeks. At the end of that time the phosphorus had changed color and was covered with a yellowish layer: the sulphurous acid, when decanted off, contained traces of phosphorus in solution.

Mr. Graham is of opinion that the action by which certain gases prevent the oxidation of phosphorus is in some measure related to that of some gases which impede the inflammation of the detonating mixture of oxygen and hydrogen gases, by means of the electric spark. I am far from wishing to contest this opinion, but I think, nevertheless, that it is possible otherwise to explain the phenomena pointed out. The luminosity of phosphorus results only from its combustion,—that is to say, from its union with the oxygen of the atmosphere. But if there be in the atmosphere gases or vapours for which phosphorus appears to have, at the ordinary temperature, more affinity than it has for the oxygen of the air, it unites in preference with these bodies. Whence it follows that its combination with oxygen cannot be effected, and, consequently, it cannot become luminous.

In support of this way of viewing the phenomena, I might also mention the solubility of phosphorus in olefiant gas, which gas, as we know, is opposed to all phosphorescence. After having left a piece of phosphorus in this gas for some minutes, it was covered with a yellowish white layer, and became red in the interior. On examining the gas, I found that it contained a certain quantity of phosphorus in solution, for nitrate of silver agitated with it gave a black precipitate.

On recapitulating the substances which prevent phosphorus from becoming luminous in the air, we find that their number is very considerable. Mr. Graham has shown that phosphorus is stopped in its slow combustion at + 18° C., and under the ordinary pressure of the atmosphere, by:—

1 vol. of olefiant gas in 450 vol. of air:
4 vol. of chlorine in 100 vol. of air:
20 vol. of sulphuretted hydrogen in 100 vol. of air:

And that the vapours of sulphuric ether, of naphtha, and of oil of turpentine, still more powerfully oppose phosphorescence.

The substances which may be added, according to my experiments, to those already pointed out by Mr. Graham are as follows:—

1. Carburet of sulphur: sudden cessation of light.
2. Creosote: } gradual diminution.
3. Eupione: }
4. Sulphurous acid: complete cessation.

As a slight trace of many of the abovementioned substances is sufficient to prevent the slow combustion of phosphorus, it is well to observe that the employment of this body in eudiometry requires great caution, and is, besides, very limited. Indeed, an accurate result could not be obtained in the analysis of a gaseous mixture, containing a trace of the substances indicated.

DESCRIPTION AND ANALYSIS OF A METEORIC MASS, FOUND IN TENNESSEE, AND COMPOSED OF METALLIC IRON, GRAPHITE, HYDROXIDE OF IRON, AND PYRITES.*

BY G. TROOST, M.D., TENNESSEE.

During my excursions through East Tennessee, I had seen small fragments of native iron, and had heard of large masses of it, which were believed to be silver. It being considered a precious metal, all that was known about it, and the place where it was found, were kept a profound secret. Some less prejudiced inhabitant at last became acquainted with the nature of the metal, and its real value was made known. To the

* From Silliman's *American Journal of Science and Arts*, April 1, 1840.

politeness of Col. Micajah C. Rodgers of Serieville, I am indebted for a considerable quantity of it; and the Hon. Judge Jacob Peck of Jefferson County, has also presented me with some small fragments. I am thus enabled to lay a description of this singular substance before the scientific public.

Having ascertained, as appears from the analysis below given, that this iron contains nickel, the mass must be considered of meteoric origin; but it differs from most of the masses of meteoric iron hitherto described. The original weight of it is said to have been about 2000 pounds. The portions that I have seen, (as well as those which are in my possession,) present a singular heterogeneous mixture of metallic iron, carburet of iron or graphite, sulphuret of iron, (pyrites,) and hydroxide of iron, the latter brown and yellow; in some parts all four ingredients form a kind of homogeneous mixture.

The most abundant constituent, however, is the nickeliferous iron, and it composes about $\frac{85}{100}$ths of the whole mass. It has partly a crystalline structure, and is in part composed of grains or globules of various sizes and forms, merely agglutinated together, or sometimes separated by a thin flexible highly polished pellicle of graphite. The crystalline part is composed of laminæ of various thickness, in the form of equilateral triangles, which are separated from each other by very thin flexible pellicles, as mentioned above respecting the grains.

I expected to find these triangular laminæ placed in such position as to form octahedrons; or showing a cleavage parallel to the sides of a regular octahedron; but this is not the case, as the cleavage gives a regular tetrahedron. I have one of these forms, which is about an inch from base to apex.

The metallic iron is also dispersed in small irregular-shaped masses through a hard, compact, brown hydrated oxide of iron. Throughout this the iron is also dispersed in invisible grains, to be detected only by the magnet, which attracts them when the substance has been reduced to powder.

This iron is malleable. I have in my possession a horse-shoe nail, which was made of it without having undergone a previous preparation, but it is harder and whiter than common wrought iron. This hardness and color may be owing to a small quantity of carbon which it contains, or perhaps to the nickel; in its natural state, however, the color of the iron differs much in different parts. In some it is black, and has no metallic lustre; in others, it has a brilliant metallic lustre, and is then always much whiter than steel or common iron. It is then but little susceptible of being tarnished when exposed to the action of the air; the black part being merely tarnished, may be rendered white by a file; in some places it is covered with a kind of black varnish.

The substance which constitutes the greatest part of the remainder of the mass, is graphite. This substance is not easily distinguished from the common graphite or plumbago, except that it is a little harder than the common granular and compact varieties, and is also rather blacker, and makes a finer, blacker, and more distinct line upon paper than common plumbago. When rubbed with a hard body it assumes a bright metallic lustre. It is not pure graphite, but rather a mixture of graphite and metallic iron. The iron can be partly removed by a magnet when the graphite is reduced to powder, but a considerable portion remains mixed with the graphite, which, when acted upon with hydrochloric acid, is dissolved with a brisk effervescence of hydrogen gas.

The sulphuret of iron, or pyrites, occupies the smallest portion of the mass. This pyrites is not attracted by the magnet, nor does it seem to act upon the magnetic needle. It can easily be cut with a knife, and is consequently softer than common pyrites. It does not give sparks when struck with steel, another property which distinguishes it from common pyrites. It is easily soluble in diluted hydrochloric acid, with a brisk evolution of sulphuretted hydrogen gas, leaving a mixed powder of white and black in the fluid. It has a more or less sub-lamellar structure, in which no regularity can be perceived, and a color between bronze yellow and copper red, often tarnished.

The hydroxide of iron, which forms part of this mass, is a heterogeneous mixture of the varieties of the ore generally known under the names of brown iron ore and yellow ochre, and resembles this terrestrial mineral. Its color is generally brownish black, passing into liver brown. The external surface of the mass is covered here and there with the yellow earthy variety (yellow ochre); how far this covering extended, I am not able to say, as the mass was too roughly handled before any part of it came into my possession. Its fracture resembles that of the common compact brown iron ore. The blackish brown variety is so very hard, that the best file is immediately dulled upon it, and leaves particles of the steel on the surface of the ore. Nevertheless, the whole is not of uniform hardness; a part, particularly the liver brown, being scratched by the file.

Some small cavities in it are lined with lamellar crystals, resembling those of white pyrites.

This hydroxide, which serves as a matrix of the metallic iron, is not, judging from my specimens, abundant in the interior of the

mass, but the exterior of the mass is entirely made up of it. At some places it is about one inch thick, while at others it is no more than one quarter of an inch, showing here and there small points of the metallic iron piercing through it.

Such are the characters and appearances of this mass, of the date and circumstances of whose fall, nothing is known. It was accidentally discovered near Cosby's creek, in the southwestern part of Cocke County, East Tennessee, and as I mentioned above, was considered as silver ore. Indeed, there is yet a fragment of it in the hands of an inhabitant, who asks for it 1500 dollars—a sum, which would be some hundred dollars too much, if it were pure silver.

CHEMICAL CONSTITUENTS OF THE DIFFERENT PARTS.

1. *Metallic Iron.*—100 grains of the metallic iron were dissolved in diluted hydrochloric acid, leaving a residue of half a grain of a black powder, similar to that obtained from the graphite. This solution, being treated with nitric acid, to convert the protoxide into peroxide, was precipitated by pure ammonia. The precipitate being washed and ignited, gave 124 grains of peroxide, = 87 grains of iron. The ammoniacal solution gave 16 grains of protoxide of nickel, = 12 grains of metallic nickel, with a trace of cobalt; loss, half a grain.

Iron	87·0
Nickel	12·0
Carbon	0·5
Loss	0·5
	100·0

2. *Graphite.*—50 grains of the graphite being pulverized and freed by a magnet from intermixed iron, were acted upon with diluted hydrochloric acid. An effervescence took place, with expulsion of hydrogen gas, owing to metallic iron, which was so intimately mixed with the graphite, that it was not attracted by the magnet. After the effervescence ceased, it was heated in order to dissolve every thing that was soluble. The insoluble part was washed and dried; it was pure carbon, and weighed 46½ grains.

The hydrochloric solution being treated with nitric acid, to convert the protoxide of iron into peroxide, and precipitated by ammonia, gave peroxide of iron equal to three grains of metallic iron. The filtered solution was treated with pure potassa, and a hardly perceptible gray flocculent precipitate was obtained, so that this iron was free from nickel.

Carbon	46·5
Iron	3·0
Loss	0·5
	100·0

3. *Sulphuret of Iron.*—A small fragment of the pyrites was dissolved in diluted hydrochloric acid, under a brisk effervescence of sulphuretted hydrogen gas. Part of it was insoluble; this after being washed and dried, was exposed to heat, by which the sulphur was sublimed, leaving a black powder. The quantity used was too small to determine the proportion; it is composed of *sulphuret of iron and carbon.*

4. *Hydroxide of Iron.*—The hydroxide of iron lost about 17 per cent. by being heated, and had all the characters of a similar residue from brown ironstone or hæmatite.

This is not the only instance in which meteoric iron has been found in the State of Tennessee. A small mass of it was found in Dickson County; another, a few miles west of Canyfork in De Kalb County. The latter had a smooth glossy surface, and was of an oval shape, its longer diameter being from 10 to 12 inches.

It is said that several masses have been found about 20 miles east from the warm springs in Buncombe County, North Carolina. I went to the spot, during my last excursion in East Tennessee, but I could learn nothing with certainty concerning it, and did not see any of the metal.*

ANALYSIS OF LIMESTONES, ESPECIALLY THE MAGNESIAN KIND, AND A METHOD OF COMPLETELY SEPARATING LIME FROM MAGNESIA, WHEN BOTH ARE PRESENT IN LARGE QUANTITIES.

BY ROBERT E. ROGERS, M. D., AND MARTIN H. BOYE'.†

Carbonate of lime, associated with more or less carbonate of magnesia, forms the principal ingredient of limestones. In some varieties the latter substance appears only as a trace, while in others it amounts to nearly 50 per cent. of the mass. When the proportion of the carbonate of magnesia is very considerable, the rock is termed magnesian limestone, or dolomite, the latter name being mostly applied to the crystalline varieties. Variable quantities of other substances, as silica, alumina, and the oxides of iron and manganese, are generallyassociated to some extent with the above principal constituents.

The silica is usually either in the free state, in the form of small transparent

* One mass, at least, of meteoric iron has been found in this county, and an analysis of it was published by Prof. C. U. Shepard, in this Jour. vol. 36, p. 81.—AMER. EDS.

† From the *Journal of the Franklin Institute of the State of Pennsylvania.*

grains of quartzose sand, sometimes impalpably minute, or in chemical combination with the alumina and iron, (clays, &c.)

The extensive use made of limestones in the arts and agriculture, as mortars, cements, fluxes and manures, renders it a matter of great importance to procure a certain and expeditious process for their analysis, especially as there exists great diversity of opinion respecting the relative efficiency of the several constituents.

We proceed to describe a mode of analysing calcareous carbonates, which we have found both certain and expeditious in practice, and therefore, we conceive, preferable to the methods generally in use, which demand extreme care and considerable time to furnish accurate results. The method here proposed we have adopted with success in an extensive series of analyses performed for the geological survey of the state.

The limestone is first finely powdered, when a given weight, about thirty grains, is digested in chlorohydric acid in the ordinary way, evaporated to dryness, moistened with chlorohydric acid, and re-dissolved and filtered. The silica, and a large part of the other adventitious substances, are thus left upon the filter. They are then calcined and weighed, a correction being made for the weight of the ashes of the filter. These steps give the amount of the *insoluble matter*.

The filtered solution, containing besides the lime and magnesia portions of alumine and oxides of iron and manganese, is neutralized with ammonia, avoiding an excess, and then precipitated with sulphhydrate of ammonium, a small quantity of which will usually suffice. When the precipitate has subsided, it is filtered, the funnel being covered with a glass plate, so as to exclude the atmosphere, and then washed with water containing a few drops of the sulphhydrate of ammonium. The filter with its contents is then removed, pressed between bibulous paper, dried and calcined. The alumina, and oxides of iron and manganese, are thus obtained together. When their quantity is such as to require them to be separately estimated, it can be done in the ordinary way.

In determining the lime and magnesia, a fresh equal portion of the powdered mineral is employed, which is decomposed by a sufficient quantity of dilute sulphuric acid, with the aid of heat. Water is then added so as to fill the vessel up to a given mark, after which alcohol of known strength is introduced in such proportion as to make the whole solution contain 40 to 41 per cent., (estimated by volume) of alcohol. The alcoholic solution of this strength* precipitates entirely the *sulphate of lime* along with the insoluble matters. When the precipitate is settled, it is filtered under cover of a glass plate, and repeatedly washed with dilute alcohol of the same strength as that previously employed, until a barytic solution indicates no trace of sulphuric acid. The whole is now calcined, and the weight of the insoluble matters as already ascertained, being deducted, we obtain the amount of *sulphate of lime*, from which we compute that of the *carbonate*.

The filtered solution now contains the sulphate of magnesia, and an inconsiderable portion of the sulphates of alumina, iron and manganese, besides an excess of sulphuric acid. It is to be evaporated until all the alcohol is dispelled, and then precipitated by pure carbonate of potassa with the precautions usually prescribed. The magnesia, alumina and oxides of iron and manganese, thus precipitated, are filtered, washed and calcined. Subtracting from the weight of the whole that of the three latter previously ascertained, we find the amount of the magnesia, which is to be estimated as carbonate.

The separation of the lime in the form of sulphate from magnesia, by an alcoholic solution, is so complete as to make it unnecessary to estimate directly the magnesia, except when we desire to check one result by the other. The above process, it need hardly be said, will apply equally to the analysis of other substances than limestones, in which lime and magnesia abound, for we have only to precipitate these earths as carbonates, convert them into sulphates, and then treat them with dilute alcohol after the manner described.

We present the following analyses by way of illustration :—

1. A white crystalline dolomite, from the neighbourhood of Montville, New Jersey. *Specific gravity*—2·853.

A portion, 1·469 grammes, was raised to a dull red heat, and the water, which was received in a tube containing chloride of calcium, was found to weigh ·007 grm. or ·48 per cent. This small amount of water is not expelled at the temperature of boiling water.

Two other portions of the powdered mineral, treated after the method described, gave these results :—

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* Alcohol of this strength has a *specific gravity* of 0·951 to 0·949 at 60° Farh. and marks between 17° and 18° Baumé. Alcohol of the shops (alcohol rectificatus Lond. Phar.) marking 54½ Pennsylvania proof—has a specific gravity of 0·835. Five volumes of this, and 6 to 6½ volumes of water, will give a very suitable mixture for the above purpose of analysis.

Insoluble matter, . .	·04 per cent.
Alumina, ox. iron, and ox. manganese . . .	·15
Sulphate of lime, and insol. matter, . .	76·09
Magnesia, alumina, and ox. of iron and manganese,	20·70

By subtracting the insoluble matter ·04 from the joint weight of the insoluble matter and sulphate of lime 76·09, we get 76·05, and subtracting the alumina and oxides of iron and manganese from the joint weight of these and the magnesia, we have for the magnesia 20·55.

A reference to the annexed table, the use of which will be explained, shows that 76·05 per cent. of sulphate of lime is equivalent to 31·54 per cent. of lime, or to 56·11 per cent. of carbonate of lime.

It also appears that 20·55 per cent. of magnesia is equivalent to 42·54 of carbonate of magnesia. The result will therefore stand thus :—

Carbonate of lime	56·11
Carbonate of magnesia	42·54
Alumina and oxides of iron and manganese	0·15
Insoluble matter	0·04
Water	0·48
	99·32

Were we to estimate the magnesia in this case by the loss, it would be 43·22 carbonate of magn. equivalent to 20·88 magnesia, or 0·33 per cent. more than the amount found by direct estimation.

With a view further to show that the *whole* of the lime is procured by the above method, and therefore that we may safely estimate the magnesia, by subtracting the carbonate of lime and other ingredients directly got from the weight of the mass, we subjoin the following example of a specimen found to contain no magnesia.

2. A white crystalline, imperfectly saccharoidal limestone, from near the mouth of Yellow Breeches Creek, Susquehanna River, Pa.

From one portion of the powdered mineral, treated with chlorohydric acid, we obtained

Insoluble matter	2·3 per cent.
Alumina	1·2
Ox. of iron and manganese	*none*

Another portion treated with sulphuric acid, and diluted alcohol of the proper strength, gave

Insoluble matter and sulph. lime 133·19.

Subtracting the insoluble matter, 2·3, from the sulphate of lime and insoluble matter, we have sulphate of lime 130·89 per cent., which is equivalent, as the table will show, to 96·3 per cent. of carbonate of lime.

The amount of water as derived from a third portion was 0·2 per cent. Our analysis therefore stands thus :—

Composition in 100 parts—	
Carbonate of lime....	96·3 per cent.
Carbonate of magnesia	*none*
Alumina.....	1·2
Insoluble matter	2·3
Water.....	0·2
	100·0

*Table for calculating Lime and Carbonate of Lime from the Sulphate of Lime, and also for calculating the Carbonate of Magnesia from Magnesia or its Sulphate.**

		1	2	3	4	5	6	7	8	9
Sulphate of lime	Lime	0·41532	0·83064	1·24596	1·66128	2·07660	2·49192	2·90724	3·32256	3·73788
Sulphate of lime	Carbonate of lime	0·73780	1·47561	2·21341	2·95121	3·68902	4·42682	5·16462	5·90242	6·64023
Magnesia	Carbon. of magnesia	2·07002	4·14004	6·21006	8·28009	10·35011	12·42013	14·49015	16·56017	18·63019
Sulphate of magnesia	Magnesia	0·34015	0·68030	1·02045	1·36060	1·70075	2·04009	2·38105	2·72120	3·06135

The first vertical column of the table contains the names of the substances, from a known weight of which we wish to compute the weight of the substances embraced in the second column. The figures in the horizontal lines represent the quantities of the substances named in the second vertical column corresponding to those quantities of the substances in the first column, which are signified by the numbers at the head of each vertical division of the table. An example will render the mode of using the table sufficiently plain.

In the first analysis the amount of sulphate of lime was 76·05. To ascertain from the table the quantity of carbonate of lime equivalent to this amount of sulphate,

* This table is taken partly from H. Rose's Analytical Chemistry, vol. ii., and partly calculated for the present purpose. The principle of this method of calculating analytical results was first set forth by Poggendorf in his Annals, vol. xxi., and has since been extensively carried out by H. Rose in his work just mentioned.

we find on the horizontal line appropriated to the carbonate, the quantity due to seven parts of the sulphate—namely 5·16463, then the quantity due to six parts, namely 4·42682, and then that equivalent to five parts or 3·68902. By arranging these in their proper decimal order, so as to impart to the several amounts taken from the table, the value they are intended to have as units, tenths, hundredths, &c., and then performing a simple addition, we get the amount of carbonate corresponding to the whole quantity of the sulphate.

The figures will stand thus:—

Sulphate of lime	76·05
	51·6462
	4·42682
	·000000
	368902
Carbonate of lime	56·1099102

In the same manner, 20·55 of magnesia will be found to be equivalent to 42·54 of carbonate of magnesia, thus:—

Magnesia.....	20·55
	41·400
	00·000
	1·035
	·103
Carbonate of magnesia	42·538

As it may be sometimes convenient to evaporate the magnesian solution to dryness, ignite it, and from the sulphate of magnesia thus procured, compute the magnesia or its carbonate. We have introduced into the table a column to facilitate the calculations.

ANALYSIS OF A CHROMIC IRON ORE, FIRST OBSERVED BY R. C. TAYLOR, ESQ., AT MAHOBAL, NEAR GIBARO, ISLAND OF CUBA.*

BY JAMES C. BOOTH AND M. CAREY LEA.

1. *Description.*—This mineral has a black color, and shining metallic lustre, closely resembling Franklinite from New Jersey. It is moderately brittle, exhibiting a chocolate brown streak, when reduced to the finest powder. The mass consists of coarsely crystalline particles, aggregated together, with intervening talcose matter, of a lighter color and softer texture than the chromic iron. This crystalline structure is so evident, that triangular faces of the octahedron are observable in a majority of the specimens.

2. Before the blowpipe it dissolves in a bead of borax or microcosmic salt, exhibiting the characteristic reaction of oxide of chrome.

3. *Analysis.*—To obtain a proper specimen of the mineral for analysis, it was coarsely broken up and separated from the gangue, as far as practicable. It was then finely pulverized, and one gramme of it ignited with carbonate of soda and caustic potassa, in order to convert the oxide of chrome into chromate of potassa.

4. The fused mass was digested with water and thrown upon a filter, which separated the oxide of iron and that portion of the mineral which had not been decomposed, from the other constituent which passed through in solution. The filter was then treated with hydrochloric acid, which dissolved the iron, leaving the undecomposed ore on the filter. This was found to amount to ·353.

5. The solution of chloride of iron which passed through, was then digested with nitric acid, and the peroxide precipitated by ammonia. This amounted to ·172. In a previous experiment, it was found to contain neither alumina nor magnesia.

6. The solution obtained by the first filtration (4), was next neutralized by nitric acid, enough being added to precipitate and redissolve the alumina. The latter was then precipitated by bicarbonate of soda, and its weight found to be ·1414.

7. The remaining solution was now evaporated to dryness with carbonate of soda, and treated with water. The magnesia thus rendered insoluble, was separated and amounted to ·090.

8. In the solution from (7), there still remained the oxide of chrome, which was estimated by concentrating the liquid by evaporation, and adding to it, while boiling, hydrochloric acid and alcohol. The chromic acid, thus converted into oxide of chrome, was precipitated by ammonia and separated on a filter. The solution passing through, still contained a small portion of oxide of chrome, and was therefore evaporated to dryness and digested with water. The oxide of chrome thus rendered insoluble, was added to that before obtained, and the weight of the whole amounted to ·244.

9. *Conclusions.*—The streak of the mineral being chocolate brown, it is difficult to say whether this color arises from the protoxide of iron or the brown oxide of chrome, a problem of exceedingly difficult solution by chemical analysis. Supposing the iron, however, to be in a state of protoxide, the ·172 will be reduced to ·1544 of protoxide. Now if ignition with carbonate of soda and caustic potassa, left a portion of the mineral

* From Silliman's *American Journal of Science and Arts*, April, 1840.

undecomposed, it may without great error be assumed that the iron in this portion has not been peroxidized by that operation, and that therefore ·353 is the correct weight of the undecomposed portion of the mineral. By adding the several weights obtained, we have,

Oxide of chrome	·2440
Protoxide of iron	·1544
Alumina	·1414
Magnesia	·0900
Undecomposed ore	·3530
	·9828

This shows a loss of 1·72 per cent., which may be ascribed in part to errors in analysis, and partly, without impropriety, to a partial peroxidation either of the iron or chrome.

By omitting the undecomposed matter, and calculating the per centage of each ingredient, we find the mineral to consist of

Oxide of chrome	38·742
Protoxide of iron	24·516
Alumina	22·452
Magnesia	14·290
	100·000

This result indicates that a portion of the talcose matter was included in the specimen, notwithstanding the care exercised in its separation. Viewing the alumina, with a little silica included in it and the magnesia, as belonging to the talc, we find the formula for the oxides of chrome and iron to be 2 : 3, or $3(FeO)+2(Cr^2 O^3)$. The formula generally received for the pure mineral is $2Cr+Fe$, and leads to the supposition that in the present case a portion of the iron exists as peroxide, a view which is strengthened by the brown streak of the mineral.

ANALYSES OF ANTHRACITE AND IRON ORE.

BY PROFESSOR JOHNSON.

In the *Journal of the Franklin Institute*, November, 1839, is a valuable paper by Prof. Walter R. Johnson, Prof. Chem. and Nat. Phil. Med. Dept. Penn. Coll., entitled "Analysis of some of the Anthracites and Iron Ores found on the head waters of Beaver Creek, in the counties of Luzerne, Northampton and Schuylkill, Pa." This paper contains an account of the geological arrangement of the coal fields lying near the head waters of the Beaver Creek, explored by Prof. J. in the summer of 1838, from which the specimens analyzed were obtained. From the cutting made for the railroad leading to the mines of the Beaver Meadow Coal Company, it is evident that there is more than one flexure in the Beaver Meadow Coal Trough. "In this cutting there is displayed a nearly vertical bed of coal, more than 30 feet in thickness; having, however, a real position or dip of S. 10° E. 85°, and consequently a course or *strike* N. 80° E." To the geological account succeed the descriptions and analyses of various specimens of anthracite.

No. 1. Sp. grav. 1·613. Water, 3·43; gaseous matter volatile at bright red heat, 4·08; carbon not volatile by simple heat, 87·48; earthy matter, 5·01=100.

No. 2. Sp. grav. 1·594. Water, 3·26; other matter volatile at red heat, 1·05; carbon, 91·69; earthy matter, 4=100. Analysis of the ashes of No. 1 and 2, gave, on an average, silica, 52·375; alumina, 36·745; peroxide of iron, 8·125; lime, 1·550; magnesia, 1·275.

No. 3. Sp. grav. 1·630. Volatile matter, 9·6; carbon not volatilizable by simple heat, 85·337; earthy matter, 5·063=100. The combustible gas given out in the distillation of this coal is of considerable amount, and indicates it as a fuel well adapted for use under steam boilers.

No. 4. Sp. grav. 1·560. Water and combustible gases, 6·89; carbon not volatile by simple heat, 91·64; earthy residuum, 1·47 =100.

Prof. J. remarks: "In comparing the results in the above analyses with those of other experiments on anthracite, I find the average amount of carbon much greater than has heretofore been assigned to that species of fuel. Thus, of twelve species of anthracite analyzed by Berthier, the mean per-centage of carbon was 79·15; ashes, 13·25; volatile matter, 7·37."

No. 5. Sp. grav. 1·6127. Combustible carbonic oxide and a little carburetted hydrogen expelled at red heat, 3·55; carbon not volatilizable by simple heat, 86·06; earthy matter, 3·71=100.

No. 6. Sp. grav. 1·559. Water, ·390; gaseous matter, including some azote, volatile at bright red heat, 5·515; carbon, not volatilizable by heat, 91·016; earthy matter and oxides, 3·079=100.

Iron Ores.—The bed of iron ore from which were taken the samples examined by Prof. Johnson, is found on the southern declivity of the bluff, about forty rods northerly from the south fork of Beaver Creek. The thickness of the bed of ore and shale is seven feet, and it lies seventeen feet beneath the surface of the ground at the point where it is opened. The *first* variety analyzed gave by the usual assay in the dry way, the following results:

Water, expelled at 250°	0·4
Carbonic acid	26·6
Cast iron	33·8
Earthy matter	26·64
Oxygen	12·55
	99·99.

The ore has a light bluish ash color, is moderately tough before calcination, and has a spec. grav. of 3·247. The pig metal given in the assay is soft, tough, and of a dark gray color. The cinder is a transparent, nearly colorless glass, very fusible, and contains few adhering particles of metal. The use of pure carbonate of lime as a flux in the proportion of one part of this metal to six parts of raw mine, will produce a complete reduction of the ore and fusion of the earthy ingredients. Assayed in the humid way, this ore yields the following results:

Water	0·40
Carbonate of iron	63·20
" of lime	2·50
" of magnesia	2·27
Oxide of manganese (?)	2·00
Silica	17·50
Alumina	10·55
	98·42

The above quantity of carbonate corresponds to 39·1 per cent. of protoxide or 30·45 per cent. of pure metallic iron, which is 3·35 per cent. below the above yield in *pig metal*, or it is 9·9 per cent. of the pig metal itself, to be regarded as pure iron matter; which is probably very near the true average amount, according to the latest and best analyses. The yield in *iron* is equal to the average of Scotch ores in the neighbourhood of Glasgow.

The *second* variety of the ore examined, was a sample from the same locality, but from a different part of the bed from that in which the preceding was found. Sp. grav. 2·896. Assayed in the dry way it gave—

Water	13·12
Pig metal	44·96
Earthy matter	24·804
Oxygen	17·11

The ore seemed to have suffered a change by atmospheric influences, from the condition of a carbonate of the protoxide of iron to that of a hydrate of the peroxide; in which process some of the earthy ingredients may have washed away. Analyzed in the *humid* way, it gave—

Water	13·12
Peroxide of iron, with a trace of manganese	63·65
Silica	13·45
Alumina	8·77
Magnesia	1·01
	100·00

The quantity of peroxide of iron corresponds to 44·55 per cent. of iron, or ·41 per cent. less than that of the metal actually obtained. Hence it appears that the quantity of iron remaining in the cinder, is very nearly equal to that of the carbon, &c., in the pig metal.

Near the second bed of coal opened on the slope of the hill north of the northern branch of Beaver Creek, Prof. J. found some ore thrown out in excavating a coal shaft. It is of a brown or yellowish brown color, compact, with small shining particles. Sp. grav. 3·555.

At a temp. of 330° it loses in moisture	0·550
By strong calcination, it loses of water	10·048
It contains of peroxide of iron	71·120
It contains of earthy impurities	13·382
	100·

The quantity of pig metal obtained in Prof. Johnson's analysis was 49·77 per cent.; its color dark gray; structure crystalline, granular. It was soft, tough, and well adapted for foundry purposes. The cinder was a perfect glass, translucent on the edges, of a smoky color, readily fusible before the blow-pipe, and consequently it presents no obstacle to the free running of iron in a furnace. This ore being in the immediate vicinity of the richest of the coals above described, will be a highly valuable resource, if it shall be found in beds of such thickness, and with such accompaniments as to render its attainment not too expensive.

ON THE FORMATION OF NITRITES IN THE DIRECT WAY.*

BY M. J. FRITZCHE.

Nitrous acid is disengaged by pouring nitric acid on starch, and this gaseous acid is directed into a thin pap, made with finely levigated oxide of lead. The latter is quickly transformed into a white mass, which, by continuing the disengagement of gas, is completely dissolved in the liquor. The deep yellow solution which is thus obtained, evaporated at a gentle heat, gives a very considerable quantity of nitrite of lead in yellow silky scales. Only a very small quantity of nitrate of lead is formed during this operation; there is no doubt that nitrous acid may be directly combined with bases.

* *Imperial Academy of Sciences of St. Petersburgh*; Sitting of August 23, 1840.

ON PEPSINE, THE DIGESTIVE PRINCIPLE.*

BY M. WASMANN.

In a very long memoir, M. Schwann has shown that the gastric juice contains a peculiar principle which he called *Pepsine*, but he had not succeeded in obtaining it in a state of purity. M. Wasmann has been able to isolate this principle, which, he says, resides in the grumous matter that fills the internal cell of the glandular membrane of the stomach.

Mr. W. prepared pepsine in the following manner :—he separated the glandular membrane from the stomach, without cutting it; he washed it and digested it in distilled water at a temperature of from 30 to 35°; at the end of a few hours, he decanted the liquid, and again washed the membrane in cold water, until it had a putrid odour. He filtered the combined liquids, and thus he obtained a transparent liquid, rather viscous and endowed with an eminent digestive power, when a little hydrochloric acid was added. In order to separate from it pepsine in the pure state, acetate of lead was added to it; the precipitate was washed and decomposed by a stream of sulphuretted hydrogen. The liquor separated from the new precipitate is fluid, colorless, and acid.

When, after having evaporated this liquor to a syrupy consistence, without raising the temperature above 35°, absolute alcohol is poured into it, an abundant flaky precipitate is produced in it, which, carefully dried, is presented under the form of a yellow gummy matter, which does not attract moisture;—this is M. Wasmann's pure pepsine.

This substance is soluble in water, which it renders acid, because it obstinately retains a certain quantity of acetic acid. The solution, even though it contains only $\frac{1}{1000}$ of pepsine, dissolves, in from six to eight hours, slightly acidulated white of eggs; but it loses its digestive power when boiled, or when it is saturated by potassa. In the latter case, it deposits flakes which are insoluble in water, and which slowly dissolve in dilute acids, forming liquors of little power.

Pepsine is recognised in the precipitates determined in its solution by the dilute acids—which precipitates are redissolved in an excess of those acids. It is distinguished from albumen by the precipitates which acetic and hydrochloric acids occasion in its aqueous solution; and from caseum, because ferrocyanuret of potassium does not precipitate its acid solutions.

The concentrated aqueous solution of pepsine is rendered turbid by bi-chloride of mercury and acetate of lead, which form precipitates soluble in the precipitating reagent, and in acetic and hydrochloric acids. Sulphates of protoxide and deutoxide of iron, and chloride of tin, likewise precipitate pepsine, and all the precipitates formed by these metallic solutions possess digestive properties.

In burning, pepsine gives out the odour of burnt horn, and leaves a carbon difficult to incinerate, in which lime, soda, phosphoric acid, and a little iron, have been found.

* Extracted from the *Revue Scientifique et Industrielle.*

ON ALIZARINE, THE COLORING MATTER OF MADDER, AND ITS EXTRACTION, &c.†

The late learned M. Robiquet, in concert with M. Colin, professor of Chemistry, gave the name of *alizarine* to one of the principles of madder: it occurs under a crystalline form, of an orange-red color.

This chemist proposed carbonising the products contained in madder by sulphuric acid, and thus to isolate the *alizarine* which is not destroyed by this carbonisation; but this not giving always identical products, M. Alphonse Meillet has just published a process by which the different madders of commerce may be tested, and the alizarine obtained at a price that will enable manufacturers to prepare it and use it in dyeing. This process is as follows :—

Ten kilogrammes of powdered madder are put into water containing in solution two kilogrammes of alum for every twenty quarts; effecting this solution at a temperature of 60° C., the whole is slowly carried to boiling, and is kept in a state of ebullition for twenty-five or thirty minutes, the decoction of madder is strained through cloths into alum water, and the residue is strongly pressed; this operation being repeated three times, is sufficient to exhaust it; the liquors are then mixed, it is left to settle for some time, and before it is completely cold, after being decanted, 625 grammes of sulphuric acid at 66°, diluted with twice its weight of water, should be poured into it, stirring all the time. Thick reddish flakes are then precipitated, immediately going to the bottom of the liquor, which, from purple red, becomes greenish yellow. The supernatant liquor is then removed, and replaced by clean water; the remainder is then filtered; it is washed several times and a purple mass is obtained, which, when dried in the open air, is pre-

† *Journal des Connaissances Necessaires et Indispensables*, July, 1840.

sented under the form of shining brown red scales. In this state, alizarine is not perfectly pure; it retains traces of sulphuric acid, xanthine, and purpurine. To deprive it entirely of these substances, the precipitate, while damp, must be heated with 6 parts of carbonate of potassa, dissolved in from 12 to 15 parts of water, to 4 of alizarine; the carbonate is afterwards saturated with sulphuric acid; a precipitate of a fine red color is then obtained; this is pure alizarine: it is dried, pulverised, and carefully washed on the filter: it is then presented in the form of an orange-red powder. The madders of Avignon have always given, by this process, 2, 2½, and sometimes 3 per cent. of alizarine.

ON GRANATINE.*

BY M. LANDERER.

M. L. obtained this substance by treating several times with alcohol the bark of the unripe fruit of the pomegranate. The alcoholic extract thus obtained was bitter and very astringent. He dissolved it in water, and added albumen, to separate the tannin from it; he afterwards filtered the liquor, evaporated it, and treated it with dilute sulphuric acid. This solution was very bitter; caustic alkalies formed in it an abundant precipitate. This precipitate was dried; part of it was dissolved in dilute hydrochloric acid, and the remainder in alcohol. From the latter solution are obtained crystals partly of a stellated form, as well as a pappy mass, in the proportion of five grains for five pomegranates.

This substance, heated in a platinum crucible, burned with the odour of burnt bread; it dissolved in all the dilute acids. With nitric acid the small stellated crystals were turned of a blood-red colour, giving rise to a substance of the nature of wax.

We do not find sufficient details for characterising this substance and assigning to it the place which it ought to occupy.

ON THE COMBINATION OF CERTAIN SALTS OF NICKEL WITH AMMONIA.

BY M. J. FRITZCHE.

Every one knows that the salts of nickel form blue solutions with ammonia, but hitherto these combinations had been obtained only in solution. However, they may easily be procured crystallized, and the author describes three of them in this note. The first is a neutral ammoniacal chloride of nickel in regular octohedra, the second an ammoniacal nitrate of nickel, of a fine blue color, also in octohedra, and the third an ammoniacal sulphate of nickel, in irregular crystals. All these bodies contain oxide of nickel and the acids in the proportions of neutral salts, and are composed like the sulphates of the analogous salts of copper.

COMPOUNDS OF CREOSOTE.‡

BY M. LAURENT.

M. Auguste Laurent presented to the Royal Academy of Sciences, Paris, at its sitting of the 20th of July, the summary of a work which he has just completed, on the new series of compounds of which creosote seems to be the radical. Its formula may be expressed by $C^{24} H^{10} O + H^2 O$. With chlorine it gives chlorophenesic acid, whose composition is represented by $C^{24} H^4 Cl^6 O + H^2 O$. Bromine converts creosote into bromophenesic acid, whose formula is $C^{24} H^4 B^6 O + H^2 O$. Creosote and sulphuric acid give a sulphophenic acid analogous to sulphovinic acid. With nitric acid, three crystallized acids are obtained, some of whose salts detonate with great violence.

In addition to the above, M. Pelouze made known a fact which was not mentioned in M. Laurent's memoir, and which the latter begged him to communicate to the Academy. This was, that if creosote$=C^{24} H^6 O + H^4 + H^2 O$, be treated by nitric acid, two new acids are obtained which easily crystallize and produce salts that detonate loudly. The first, nitrophenasic acid, has this composition: $C^{24} H^6 O + O^2 + Aq + 2 Az^2 O^5$. The formula of the second, nitrophenesic acid, is $C^{24} H^6 O + O^2 + Aq + 3 Az^2 O^5$.

ON AN EASY METHOD OF PREPARING CHROMIC ACID, AND ON THE MANNER IN WHICH IT ACTS WITH SULPHURIC ACID.§

BY M. J. FRITZCHE.

M. F. cautiously pours concentrated sulphuric acid into a hot and concentrated solution of bi-chromate of potassa, and obtains a bulky, crystalline, crimson precipitate, which he separates and dries by heat, and afterwards *in vacuo*. This is

* *Journal de Chimie Médicale*, August, 1840.

† *Imperial Academy of Sciences at St. Petersburg*; Sitting of November 22, 1839.

‡ From *L'Institut*, No. 343, July 20th, 1840.

§ *Imperial Academy of Sciences of St. Petersburgh*; Sitting of August 23, 1840.

chromic acid, which is washed to remove any supernatant liquor and sulphuric acid that may yet adhere to it. As to the combination of sulphuric and chromic acids, which M. Gay Lussac described in the *Annales de Chimie et de Physique*, t. xvi. p. 102., the author has never been able to obtain it, and he is much disposed to doubt its existence.

[We have long been acquainted with this method of obtaining chromic acid, which M. Fritzche has here given as new. EDS. CHEM.]

ANIMAL HEAT.*

Dutrochet has found that the temperature of the frog in the open air is 1° C. lower than that of the surrounding atmosphere; but that when immersed in water, its temperature is 0·3 to 0·5 C. higher than the surrounding air. The temperature of the grey lizard was 0·18° lower than that of the atmosphere. The temperature of the carp when plunged in water is the same as that of the liquid. The leech and snails are colder than the atmosphere.

ORIGIN OF THE MINERAL DYSODIL.†

In 1808 Sordier classed this mineral among bituminous substances. It is well known in Sicily, where it is employed as a combustible substance.

Ehrenberg, in a paper published last year, demonstrates that this substance, which resembles yellow wax, is formed of the siliceous debris of naviculæ, cemented together by a kind of resin. He shows also that it exists in the collection of Krantz of Berlin, in a lignite of Westerwalde, the colour of which is black, and in which all the microscopic characters of the yellow dysodil of Sicily may be recognized, but with some difficulty, because it is mixed with a considerable quantity of the pollen of pines and other vegetable remnants. Ehrenberg has since found it also in the bituminous foliated coal of Geistinger Busch, near Rott and Siegburg, and also in the foliated lignite of Vogelsberge. He concludes that dysodil is produced by the agglomeration of infusoria, and is obviously a polishing slate, accidentally infiltrated with mineral tar; whilst at Bilin, near Cassel, it is found existing without any mixture of bitumen. Its colour may be yellow or brown or black: it occurs generally in extensive beds, and in sufficient quantity to be used for economical purposes.

PELOSINE.‡

This substance has lately been extracted by Wiggers from the root of the *Cissampelos Pareira (Pareira brava)*,—a drug which has lately been introduced into the English pharmacopœia. The root is to be cut into small portions and boiled with water acidulated with sulphuric acid, three or four times successively; the decoction is then to be precipitated with carbonate of soda; the brownish grey precipitate is to be washed, dried, and boiled again with acidulated water; the solution treated with animal charcoal, filtered and precipitated with carbonate of soda; the yellow resulting precipitate is to be washed, dried, and treated with ether. This affords pure *pelosine*. It is colourless; when water is added to the solution in ether, a yellow translucid substance is precipitated, which is *pelosine*—free from water. It is uncrystallizable, without smell, sweetish bitter. It is a powerful base, forming salts with sulphuric muriatic, nitric, acetic, oxalic and tartaric acids, but none of the products crystallize.

CHEMICAL ERRORS.§

Professor Erdmann has demonstrated that the statements of Dr. Golding Bird and Mr. Brett respecting the presence of titanic acid in Hessian crucibles are incorrect, and that they had mistaken impure silica for that substance. M. Marchand has also refuted the experiments of Dr. G. O. Rees, who affirmed that he had detected titanic acid in the blood, mistaking silica for that acid. The form of silica, which deceived these gentlemen, is familiar to practical chemists.

* From *The Athenæum*, Aug. 15.
† Ibid.

‡ From *The Athenæum*, Aug. 15.
§ Ibid.

II. CHEMICAL MANUFACTURES.

GENERAL CONSIDERATIONS ON THE APPLICATION OF THE PHYSICO-CHEMICAL SCIENCES TO THE NATURAL SCIENCES, TO THE ARTS AND TO MANUFACTURES.*

BY M. BECQUEREL.

In the rapid whirl which, at the present period, bears along the mental powers—in the midst of our most sober daily concerns—every one wishes to be initiated into the mysteries of natural philosophy, and is eager for discoveries in physics and in chemistry, especially when they promise useful applications to the arts and manufactures. It is to discoveries of this nature that I wish to call your attention: happy if I am enabled to demonstrate to you that the numerous investigations which have given rise to them, may sometimes contribute to the public good: but, before explaining them, permit me to offer a few remarks concerning experiments in general.

Without the art of experimenting, physics, and chemistry, whose alliance has been productive of such great results, could not exist: but since it has been brought to perfection, nothing has been able to arrest their progress: however, to render the study of physics popular, it must be presented free from every obstacle.

When a young man sees, for the first time, the instruments used in the study of physics, the finish of whose ornaments frequently contends with their precision, he should ask himself whether this science may not be cultivated, with the hope of extending its limits, without having at his disposal the means of acquiring similar instruments. This single idea, if he has no other guide than himself, would be sufficient to deter him from devoting himself to a study, for which, before seeing a physical cabinet, he felt a decided inclination. But if he consult the works of the philosophers who have studied, fathomed, and analysed natural phenomena, from Galileo to the present time, he will be convinced that the greatest discoveries, with the exception, however, of those which require very accurate measures, have most frequently been made with instruments formed of the first objects which could be procured, and which are always at the disposal of him who knows how to investigate nature. Among a thousand instances I may mention the following:—

Galileo, at the age of eighteen, discovered the isochronism of the oscillations of the pendulum, by observing the periodical and regular motion of a lamp suspended from the roof of the church of Pisa, his native place.

Torricelli discovered the pressure of the atmosphere by means of a glass tube closed at one end, filled with mercury, and reversed in a bath of that metal.

Franklin, in order to establish the identity of lightning with electricity, sent up a kite into the atmosphere.

Volta constructed the most admirable instrument which the physical and chemical sciences possess, with discs of silver, and little round pieces of damp cloth disposed in columns.

Haüy, by the aid of a knife and a kind of coarse compass, was enabled to find the crystalline system of every mineral substance, and consequently its molecular constitution.

Finally, do we apply physics to the study of natural phenomena? Nature herself becomes the laboratory, and we have, as instruments, the various objects profusely diffused over the surface of the globe. By simplifying the means of investigation, the study of physics is rendered less difficult; time is saved, and thus, life is doubled.

In the explanation of works, the same simplicity should be kept up; for history teaches us that the scientific career of a man frequently is reduced to a few general facts. Detailed works, executed to arrive at these facts, remain laid aside in scientific repertories, and may be compared to scaffoldings erected in order to raise a building, which, the edifice once finished, are pulled down. Hence it is that the scientific life of a man may be summed up in a few words; but these few words express eternal truths, imperishable monuments of the genius which discovered them. Thus, Kepler is known by his three famous laws, the fruit of more than twenty years' labor, and which, in immortalizing him, served Newton as data to find the laws of gravitation, whose action extends all over the universe. It is thus, also, that Newton himself shines forth with brilliant lustre, as having discovered the composition of light, and the laws depending on it; and Volta, as having constructed the pile; that Œrsted acquired great renown by having discovered the action exercised on a magnetic needle by an electric current, and Malus, for the discovery of the polarization of light, by means of reflection.

* A lecture delivered to the Royal Academy of Sciences, Paris, at its sitting of the 13th of July, 1840.

In order to obtain such great results, which may be expressed in few words, experiments must often be multiplied *ad infinitum*, and a host of detailed facts must be taken into consideration which pass unnoticed in the world.

Such are the general principles which should direct the philosopher in his tedious investigations. I now arrive at less general questions.

Every branch of physics has had its phases of glory, its times of repose, and its recrudescences, which, by turns, have extended its limits. Since nearly half a century, electricity has made rapid progress, and one cannot tell where its discoveries will stop, which are all stamped with the illustrious name of Volta.

In Europe, and, I may even say, in all parts of the world, there is an emulation among all philosophers to extend its dominion, which cannot fail to produce the most beneficial results, as will be seen from the sketch which I am going to offer of the discoveries made within the last few years.

All bodies in nature are formed of homogeneous, or heterogeneous particles, kept at greater or less distances, by the action of forces, the agents of which are found in the spaces which separate them: these forces are, in unorganized bodies, heat, electricity, affinity, and cohesion; and, in organised bodies, those which preside over the phenomena of life, and whose principle escapes all investigation. It is, therefore, in these intermolecular spaces that the most mysterious, and I may add, the most sublime phenomena of nature, are operated. If the particles lose their natural position of equilibrium by any cause whatever, there results a host of physical and chemical effects. To study the molecular constitution of bodies, with respect to the forces which govern this constitution, these forces are taken, separated, and put successively in the presence of the material particles, in order to determine the mode of action of each them, and their mutual relation. It is then recognised, that if electricity be not the first cause of heat and affinities, it is, at least, indispensable to their production, each of these forces being unable to exist without it.

Experiments based on the velocity of electricity—a velocity of 90,000 leagues per second, and greater than that of light—tend to prove that the quantity of electricity associated with the particles of bodies is so enormous, that the imagination is startled at it. The elements of a simple particle of water appear to contain, according to the calculations of a celebrated natural philosopher, 800,000 charges of an electric battery composed of eight equal troughs, of two decimetres in height and six in circumference, and obtained with thirty turns of a powerful electric machine. If the quantity of electricity which is accumulated in the elements of a single particle of water were suddenly to become free, the most terrific detonations would be heard, which would shatter this edifice* to atoms. In fact this power, compared with which steam is nothing, whether it be considered as a very subtile matter, or as the result of a vibratory motion of the air, is uniformly employed by nature in maintaining the combinations and molecular constitution of bodies. The efforts of natural philosophers, therefore, ought to tend—as indeed they do daily tend—to withdraw this force from the bodies which contain it, in order to apply to the sciences and arts. As yet we have been able to liberate only a very small portion, which, nevertheless, produces chemical, calorific, or mechanical actions of great intensity. What, then, will it be when we are completely masters of it?

This force is liberated in all chemical actions, even the weakest, as heat in combustion and in all molecular phenomena; but, as heat is rendered available in chemical operations, so also should we turn to account the electricity disengaged, in order to provoke affinities where they are not manifested, to give them, when required, new energy, to transport bodies into different media, and to produce calorific effects even superior to those which we are able to obtain with our furnaces. Such should be the object of electro-chemistry. As an application of the calorific effects of this power, I may mention the following example:—

A platinum wire, communicating with the two extremities of a voltaic apparatus with an uniform current, becomes incandescent for some portion of its length. If this part be spirally twisted, all the heat is then concentrated in the interior of the circumvolutions. If small crucibles, with thin sides, made of a refractory earth, be placed on it, the greatest imaginable effects of fusion are produced, since the platinum itself may be fused: the eye can scarcely support the light given out: assays of gold or silver ores of several decigrammes are effected in two or three minutes, to liquefaction and cupellation; the combustion of the diamond is operated in a few instants. This is not all; even this helix may be put under an exhausted bell-receiver, into which may be introduced all the gases with which we mean to operate, so as to fulfil conditions which the chemist has not always the possibility of combining.

The thermo-electrical instruments some years ago employed to determine the inte-

* The *Academie Royale des Sciences*, Paris.

rior temperature of the body of man and of animals, have again been used for the same kind of investigation, and particularly for studying the instantaneous calorific changes which the organs experience in various pathological cases, or under determined physiological circumstances, and which cannot be appreciated by ordinary thermometers: they have also served for ascertaining that vegetables have a heat of their own, although very different from that of the ambient media; that this heat is inappreciable during the night on account of the sleep of plants, and that it again shows itself under the influence of light, whilst the heat of the buds and flowers remains during the night.

The electrical forces, acting chemically, furnish us with the means of studying the influence of masses in the phenomena depending on affinities (a subject which greatly occupied philosophers at the commencement of this century), and to measure these affinities under various circumstances.

In a combination of two atoms, the two atoms are united to one another by virtue of a force called *affinity*, whose nature is unknown to us, and which varies in intensity according to temperature and various physical causes. Now, if, with an exceedingly delicate instrument, we could lay hold of each of these atoms, and pull them in a direction contrary to their reciprocal attraction, the force employed to conquer the effect of this attraction might serve as a measure of it. Instead of this ideal apparatus, we have, in electric currents, a power capable of fulfilling the same functions. From the facts observed, it results that when two salts of the same acid are dissolved in water, we have an accurate means of determining the relation between the affinity of the acid for each of the two bases, and of following, step by step, the variations which this relation undergoes as that of the saline bases changes. The law of masses which fetters all these relations allows two metals, or any two substances in solution, to be separated from one another, without recourse being had to the ordinary chemical means.

There are few phenomena in the production of which electricity does not participate: phosphorescence is of this number. Recent observations on the property which certain bodies possess of becoming luminous in the dark, under the influence of various causes, reveal to us in the light, particularly in the electrical light, a new faculty. It is known that the solar spectrum resulting from the decomposition of light by the prism is composed of various parts which possess, some the calorific, others the chemical, faculty. It is also known that light renders various bodies phosphorescent, which have been exposed to its action for a few instants, and that all parts of the spectrum do not possess this faculty in the same degree. The observations in question show that different substances, such as glass, gypsum, &c., which allow of the passage of light entirely, or without sensible diminution, may partially or even totally remove from it the power of rendering bodies phosphorescent. Thus, this power is perfectly distinct from that which a focus of light possesses of lighting or heating bodies; light probably has yet many other properties which may one day be discovered!

Such now is the delicacy of our instruments, that we can study the chemical changes of light in circumstances under which formerly they could be recognized.

Works on the application of electro-chemical force to the metallurgy of silver, copper and lead, without the intervention of mercury, employing but little fuel, or even none at all in many cases, the general principles of which I acquainted you with in a former lecture, (for which see *The Chemist*, No. VI. page 164), have been successfully continued on considerable quantities of ore procured from different parts of Europe, Asia and America. The researches have been carried on—1st, in the immediate separation of metals from each other, particularly of silver from lead, in galena; an operation so rapid that two kilogrammes of silver may be extracted, in the metallic state, from a silver ore, properly so called: 2ndly, in the preparation to which the ore is subjected, in order to dispose of each metal to be removed by the electric current, —a preparation which, varying according to the nature of the ore, does not present any difficulty when the silver exists in it in the metallic state, or as a sulphuret, as is most frequently the case with that from Peru and Mexico, whilst it is more complicated when the silver is in combination with other substances, the employment of small quantities of fuel then becoming indispensable for effecting roasting at a low temperature.

In those rich countries it frequently occurs that the ores are abandoned, either for want of the fuel required for smelting them, or preparing them for amalgamation, or on account of the distance from the sea, at which they are found, which is unfavourable to their removal to Europe, where they might advantageously be treated.

In Columbia, where considerable quantities of very zinciferous gold and silver ores are found, the richest are sometimes exported to Europe to be smelted, whilst the poorest, and those of an average quality are abandoned, or treated with so little advantage that the companies are losers by it. They are now endeavouring to introduce new means of preparation which apply as well to amalgamation as to the electro-che-

mical process: we are therefore led to think that this process will very soon be put in practice, if not entirely, at least to a great extent, in those countries of both divisions of America, which possess the requisites,—abundance of sea-salt, and, in some cases, a little fuel.

The silver ores, which most resist amalgamation, and other modes of treatment, are those which contain much copper or arsenic. The quantity of these ores is very considerable, particularly in Chili, which the inhabitants offer to the Europeans, who sometimes, for want of freight, take them as ballast, without being certain of deriving any advantage from them, in consequence of their ignorance of their contents and of the mode of treating them. Sometimes also it happens (and that has very recently been seen) that the Europeans get ores whose richness in silver and copper is insufficient to defray the expense of freight and treatment. It is therefore necessary to separate from these ores, in Europe, and at small cost, the silver, copper, and arsenic. This problem has just been solved in a very satisfactory manner, presenting advantages to speculators who are more enlightened than their predecessors.

In studying the cause of the working of these mines in America being given up, it will be found that it must be attributed, not only to the difficulty of heating certain ores, but also to the price of mercury, which is so high, that, in Mexico and Peru, small works have been constrained to stop; and, moreover, to the difficulty of getting rid of the water which inundates the mines. The latter obstacle often causes considerable injury to the European companies established in the New World. These inconveniences, serious as they may be, are not insurmountable: to conquer them, stability is required in the social state of each country, and that the arts and sciences encouraged in them should be universally diffused.

It is not the same in Asia, in the Russian possessions, where great mineral riches exist, from which great profits are daily being derived, owing to the gradual and judicious introduction of improvements made in Europe in the treatment of the precious metals, from which immense advantages will accrue to the Russian empire.

In the silver mines of Altaïa, which belong to the emperor, and whose produce is very considerable, the working is directed with method and economy. The expenses of extraction, of treatment and management do not amount to more than a fourth of the rough product, notwithstanding that the ores are generally very poor. These advantages are owing to the very low price of hand labor, to the abundance of fuel and substances necessary for smelting,—advantages not generally met with in America,—where the price of the daily labor of a miner is ten times as high, and where fuel is wanting, especially in Mexico, and in the Cordilleros, on account of the elevation of the mines above the level of the sea.

Although the electro-chemical treatment perfectly applies to the ores of Altaïa, and has recently been proved by a very considerable quantity submitted to this process, yet it must not be dissembled that in countries where fuel is abundant, and sea-salt rare, fusion will always be preferable, except in the case of complex ores, which are often a stumbling-block to metallurgists.

Silver mines are not very numerous in Russia: the only important ones, are those of Altaïa and Nertchtinsk. A few exploitations in the Caucasus and the Oura, may also be mentioned; but the great mineral riches of this kingdom chiefly consist in the auriferous and platiniferous sands, the washing of which,—the only treatment which they have hitherto been able to employ for extracting the gold and platinum,—at present occupies all the attention of the government. This washing, although carefully executed, is still imperfect, for a considerable portion of gold is not unfrequently lost in the sands. Nevertheless, the product is very considerable, since, in 1839, it was 6100 kilog., that is about 20,000,000 francs.

The auriferous and argentiferous galenas, which have been treated for silver and lead by the electro-chemical process, are perfectly disposed for the extraction of the gold by washing. Indeed this treatment requires a pulverisation, and a roasting which disengage the gold from the pyrites and other compounds which retain it; the silver and lead being removed, the ore is found reduced to nearly half its weight, and the washing may then be effected with great facility: the quartz and other light matters are in such a state of division, that a man who is well used to it may wash several hundred kilogrammes a-day. Its application has quite recently been made to the argentiferous galena, a few years ago discovered at Saint-Saintin-Cantalés, department of Cantal, and the quantity of whose gold did not amount to more than a decigramme and a half in 100 kilogrammes of ore, containing 30 per cent of lead. After the electro-chemical treatment and washing, we soon obtain residues which contain 8 grammes of gold, and even more which may advantageously be treated, whether by smelting or by carrying the washing farther. From this we are led to believe that the rocks of this country are auriferous, as also the etymology of Aurillac (*aurilacus*) would tend to prove.

These results confirm the advantages ob-

tained by one of our brethren, in roasting auriferous pyrites, before washing them to extract the gold,—advantages which have been disputed in some countries, especially in Russia. It appears that the scarcity of fuel is the only obstacle to its application on the large scale in America.

Gold is generally found in Columbia, and in the United States, in the rocks known to geologists by the names of syenite, porphyric syenite, mica schist, and gneiss, and the quantity is so much the more considerable as the rocks are in a greater state of decomposition; it is the same in Russia where the auriferous rock is diorite; this general fact, which the principles of electro-chemistry turn to good account, has suggested a very simple mechanical process, which allows of the parts containing gold being immediately separated from those which are deprived of it, so that only a certain portion of the auriferous sands have to be submitted to washing.

If we afterwards seek to determine what advantages may result from metallurgical works, we shall see that they necessarily bring to a desert country the benefits of civilisation, and, where formerly nothing but unoccupied land was found, villages are built without delay; but if, by a wise foresight, power does not make its happy intervention felt, by encouraging agriculture, these localities, which are crowded by a rich population, may soon become nearly deserts,—of which Villa Rica, in Brazil, is an example.

In the time of its greatest prosperity, when the annual produce of the auriferous sands amounted to nearly 120,000,000 francs, its population amounted to 20,000 souls. For a century this vast product has gradually diminished; the inhabitants, wholly occupied in the washing, neglected the benefits which agriculture would have procured them in that beautiful and fertile country.

The distance from the metropolis, domestic troubles, carelessness of administration, and the exactions of power, caused many to emigrate. Scarcely does this town now present to the traveller, the shadow of its former splendor!

It is very different in the districts of the mines of Altaïa, where there is a working population of 25,000, and 120,000 agriculturists. The encouragements granted to the latter are such, that the best cultivated lands are those in the vicinity of the mines. Hence necessarily results an increase of population which will allow of greater scope being given to the metallurgical operations, as soon as all the hands are not occupied in the clearing and culture of the lands—the only means of peopling these vast countries.

If we now look at the other applications of electricity, we perceive that the same processes which serve for the treatment of metals—with some modifications, however—are successfully employed for gilding silver and copper objects,* to a degree of perfection which leaves nothing to be desired, and likewise for taking impressions in copper, of medals, bas reliefs and plates engraved with a graver, which have all the beauty and polish of medals. The galvanic moulds copy in relief all the prominent parts of these plates, and the cast copy gives impressions on paper. The number of good impressions which such a plate can furnish is very limited; but there is the advantage of being able to replace it by another, when it begins to wear out.

This power, which by turns becomes, heat, light and chemical power, is also capable of producing the effects of steam, so far as we can judge from experiments first made in the United States, and more recently in Russia; in the former, it has been applied to the use of a printing press; in the latter, to the navigation of the Neva.

A six-oared sloop, fitted with paddle wheels put in motion by an electro-magnetic machine, acting by means of a small voltaic apparatus, sailed up that river, against a very light contrary wind. Certainly if the expence necessary for setting in action an electro-magnetic machine capable of moving a man-of-war were calculated, it is probable that it would be of a nature to cause this new application to be at present abandoned; but when we reflect that bodies contain between their particles an enormous quantity of electricity, and that every day we are able to obtain a greater quantity of this power, at less expense, we are led to hope that we shall one day see it liberated in sufficient quantity to be applied to the purposes of navigation. Thus, far from rejecting the first attempts made in the north for substituting the employment of electric currents for that of steam, we should, on the contrary, encourage investigations, which, perhaps, will lead to the solution of one of the greatest manufacturing questions which could be proposed.

The powers by aid of which the metals are extracted from their ores have such energy, that they may one day be used for setting in motion apparatus for grinding, and making ores undergo the various mechanical preparations without which the treatment could not be carried on.

In the face of so many facts, whose importance is every day better appreciated, it is easy to perceive what the future may derive from the employment of a force whose power may be called infinite, which exists

* For the process of gilding metals without mercury, by electro-chemical action, see "*The Chemist*," No. VI. page 180.

fettered and neutral wherever there is matter, and of which man will perhaps one day be able to make himself master.

In examining the present in order to prejudge the future, we shall see that the imperative wants caused by the increase of population, resulting from the progress of civilisation, will require the forests to be cleared; that coal pits are not inexhaustible, and that a time must come when the scarcity of fuel will be a serious obstacle to metallurgical operations. This time is, it is true, yet very far distant, but let us now prepare, for the benefit of posterity, the means of extracting metals from their ores, and of carrying on various manufactures, without the intervention of fires.

ON THE ADULTERATION OF BREAD.

BY CHARLES WATT.

That the adulteration of bread is carried on in the metropolis and other large towns to a most serious extent cannot, for one moment, be doubted; indeed, the circumstance that there are in the branch of business which manufactures this chief commodity of life,—(which, if deficient, admits of no substitute,) two distinct classes of tradesmen, viz.:—one called "full-priced bakers," from their selling bread at the regular trade price, and the other, "cheap" or "low-priced," from their selling it at a lower rate,—naturally leads to such inference. When we consider the fact, which is well known, that the difference in price varies to the extent of two-pence, or more, in the four-pound loaf,—we can come to no other conclusion than that this vast difference, viz. one-fourth, can proceed from no other cause than the most extensive and culpable adulteration.

In order to satisfy public anxiety on this subject, it has often been submitted to attentive and close inquiry, and the answers received from these "low-priced" bakers are, universally, "that the reduction is dependent on their keeping no men to carry out the bread," while the replies from the high-priced bakers are, that "they use the best flour, and that those who sell cheaper must do otherwise."* That the trifling amount of wages thus saved can make up for so serious a difference in price as exists, is by far too ridiculous to be for an instant admitted.

Any one may, with very little trouble, be satisfied that there are very serious malpractices carried on with regard to the manufacture of bread, if he but take the pains to examine that purchased at different shops.

At some of the more respectable houses at the West End of the town,—from which the higher classes are supplied,—the bread is of a fine whiteness, is exceedingly light, and the crust is not hard and dry; while at those houses in the lower districts of the town where there is a crowded and poor population, it is of a very dark colour, is heavy, and the crust has a hard and compact appearance, which latter circumstance arises entirely from the quantity of inferior flour, and the admixture of a large quantity of potatoes.†

The adulterations of bread are of two kinds, noxious and innoxious; the noxious are such as may by repeated action become injurious: these are alum, sulphate of copper and zinc,‡ chalk, plaster of Paris (sulphate of lime), and bone dust.

With the observations of Dr. Ure, in his valuable work on the arts, "that it is a very serious thing for a lady or gentleman § of sedentary habits or infirm constitution to have their digestive powers daily vitiated by damaged flour, whitened with 197 grains of alum per quartern loaf: acidity of stomach, indigestion, flatulence, headaches, palpitation, costiveness, and urinary calculi, may be the probable consequences of the habitual introduction of so much acidulous and acescent matter,"—we entirely agree.

Alum may be detected in bread by treating the latter with distilled water, filtering the liquor thus obtained, first through calico, and then through blotting paper, till it is

* It must be observed, that the adulteration of bread is by no means confined to the "low-priced" bakers, for it may be policy for the "full-priced" dealers to keep up the farce of high prices, in order to check suspicion; for there are many who think nothing good unless it is dear.

† The method of detecting this adulteration is given by M. Sellier of Paris, and consists in subjecting suspected flour to the action of electricity. See *The Chemist*, No. VII. page 222.

‡ Sulphate of copper may be detected by acting on the poisoned bread with distilled water and testing the water with ferrocyanate (prussiate) of potassa: the reddish-brown precipitate or tint, characteristic of copper, will appear even with small quantities. Should the poisonous substance be still more minute, the bread must be treated with very dilute nitric acid, either directly, or after incineration, in a platinum crucible, and the solution, after concentration by evaporation, should be tested by the ferrocyanate of potassa. By this means the smallest quantities of sulphate may be detected.

§ He might have added the poor also, whose chief food it is, and who suffer so much to obtain it.

quite clear, then dividing it into two portions, into one of which is to be poured a few drops of nitrate or muriate of baryta, and into the other a few drops of liquid ammonia.

Chalk, plaster of Paris, or bone-dust may be detected by incineration of the bread containing them, and treating the ashes with nitric acid, which will dissolve the chalk with effervescence, and the plaster of Paris and bone-dust without. In each of these cases the lime may be rendered evident in the solution either by oxalic acid, or in preference, by oxalate of ammonia.

The innoxious adulterations are chiefly inferior flour,* rye flour, and also that of beans, peas, and potatoes, substances which, as possessing less fecula than wheaten flour, are very inferior in their nutritive properties, and, therefore, their introduction into bread is a fraud on the public, which requires the strictest vigilance to prevent, and should be punished by the highest penalties when detected.

As any adulterations of this kind can be discovered in the flour only before it is made into bread, we shall detail the means of testing the genuineness of flour.

Dr. Ure very properly observes that "every baker ought to be able to analyse his own flour."† The analysis is performed in the following manner. A ductile paste is first to be made with a pound of genuine flour, and a sufficient quantity of distilled water, and left at rest for an hour; then having tied across a bowl or basin, a piece of silken sieve stuff, a little below the surface of the water, the paste is to be laid upon the sieve on a level with the water, and kneaded gently with the hand, so as merely to wash the particles of fecula out of it. This portion of the flour immediately gets diffused through the water, some of the other constituents dissolve, and the gluten alone remains upon the filter. The water must be several times renewed until it runs off quite clear, and free from all milkiness. The last washings of the gluten are made by taking it out of the sieve, and holding it in the hand.

The whole of the turbid washings are to be put into a tall glass, or stoneware vessel, and allowed to remain at rest in a cool place until they deposit the starch. The clear supernatant liquor is then to be decanted off. The deposit consists of starch with a little gluten. It must be washed till the water settles over it quite clear, when it is to be dried.

The filtered waters being evaporated at a boiling heat, discover, floating through them, flocks, which have by some been supposed to be albumen, and by others gluten; at last phosphate of lime is precipitated. When the residuum has assumed a syrupy consistence by cooling, it is to be mixed with alcohol in order to dissolve out its saccharine matter. Cold water being added to what remains, causes a solution of the mucilage, and leaves the insoluble matter, containing azote with the phosphate of lime.

By this mode of analysis a minute portion of resin may remain in the gluten, and in the washing water; the gluten also retains a small portion of fixed oil, and a volatile principle, which may be removed by alcohol. If we wish to procure the resin alone, we must first of all treat with alcohol, the flour previously well dried.

When corn flour, deficient in gluten, is to be analysed, the dough must be inclosed in a linen bag, kneaded with water, and washed in that state.

When barley-meal is analysed according to the preceding process, a substance termed hordeine, mixed with fecula, is obtained; it may be separated by boiling water which dissolves the fecula, and leaves the hordeine.

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* In the mills near London, no less than seven different kinds of flour are ground out of one quantity of wheat.

These are for one quarter:

Fine flour	5 bushels	3 pecks.
Seconds	0	2
Fine middlings	0	1
Coarse middlings	0	0·5
Bran	3	0
Twenty-penny	3	0
Pollard	2	0
	14	2·5

† This observation is very important so far as the baker is concerned, but we are well aware that the flour often comes into his possession in a genuine state, and undergoes, while in his hands, a most serious amount of adulteration. It is, therefore, the bounden duty of the Legislature to provide some efficient means of putting a stop to so serious an evil. In this article, and likewise in other trades, adulterations are carried on to an alarming extent and with perfect impunity. A board of commissioners ought to be appointed to examine the various articles of life, such as food, medicines, important articles of commerce, &c.,—to condemn every bad article, and to fine those who thus violate the just laws and every duty to humanity.

Bread,—the most important of all articles of life to us all—the chief support of the poor—it is worse than wicked to adulterate. We hope, therefore, that some means of correcting so flagrant an evil will speedily be adopted.

In the preceding statement, having given a brief account of the various frauds on the community practised by those who are engaged in making that important article of food—bread, and the best means of preventing their occurrence, and likewise of detecting them when committed—we trust that we may be the means of attracting public attention to the subject; and if so, we shall consider our efforts not made in vain, nor shall they at any time be wanting to the furtherance of so desirable an object as the prevention of fraud.

KEENE AND CO'S MARBLE CEMENT.

The patentees form their cement by combination of the sulphates of lime and alumine, which they afterwards calcine at a red heat. The following is an outline of the process:—

A quantity of gypsum, (sulphate of lime,) in lumps, having the water of crystallization first evaporated in the same manner as in the manufacture of plaster of Paris, is to be placed in a large tank previously charged with several gallons of water, holding in solution a quantity of alum in the proportion of about one pound to each gallon of water; the gypsum must be allowed to remain in this solution until it has absorbed as much of the liquid as it possibly can. The stone thus saturated is then to be removed from the tank, and suffered to dry in the open air, after which it is to be calcined at a red heat, in a furnace, oven, or kiln, for the purpose of fixing the alum. The stone must then be reduced to powder, by any convenient apparatus, and if thought desirable, it may be sifted, when it will be ready for use.

For the finer kind of cement, the best quality of gypsum is to be selected, and instead of using the common alum of commerce, the clarified or concentrated aluminous mother liquor of the required strength, as being free from any alkali or other extraneous matter, is found best to answer this purpose.

This process for forming marble cement presents another instance of the value of chemistry to the arts, by the introduction of a most beautiful and durable substance, to which we feel it our duty to call the attention of our readers. By the kind permission of the sole manufacturers, Messrs. White and Son, of Milbank-street, Westminster, we have had an opportunity of inspecting it in all its forms and varieties, as well as the method of using it, and the purposes to which it is applied.

It is prepared of two qualities,—coarse and fine: the coarse is used as a plaster, and as a ground work; it is also used as a stucco for the exterior of buildings; for which purpose, in consequence of its resistance of wet, its hardness and its entire security from cracking—a fault so common in other cements—it is peculiarly applicable and advantageous.

The fine quality bears a very beautiful polish, and forms an elegant and unique production of the highest lustre and most delicate whiteness; capable of receiving every tint and shade of color, which taste or fancy can suggest, of being moulded or formed into the finest designs of architectural decorations, and possessing a hardness and durability greatly surpassing scagliola and other artificial productions.

In the art of forming cements, no longer will we yield the palm to the ancients, whose secret—so much boasted of by the antiquary—has for ages been lamented as lost for ever to mankind;—the marble cement is a proof of the ill-judged preference given to the works of antiquity, and will remain an imperishable monument of native ingenuity and application, which cannot fail of being duly appreciated by the artificer and the public.

ON THE MANUFACTURE OF FLINT GLASS.*

BY APSLEY PELLATT, ESQ.

Flint glass,—called by the French "cristal," from its resemblance to real crystal,—is composed of silex (whence the English name), to which is added carbonate of potash and litharge, or red lead: to the latter material is owing, not only its great specific gravity, but its superior lustre, ductility, and power of refraction. For optical purposes, it is necessary that flint glass should be perfectly free from striæ, otherwise the rays of light passing through it diverge and become distorted, and this defect is caused by the want of homogeneity in the melted mass, occasioned by the difficulty of perfectly fusing substances of such different density as the materials employed. The materials, being properly prepared, are thrown at intervals into a crucible of Stourbridge clay, which will hold about 1,600 lb. weight of glass when fused. The mouth of the crucible is then covered with a double stopper, but not luted, to permit the escape of the moisture remaining in the materials, as well as the carbonic acid gas and excess of oxygen. It requires from 50 to 60 hours application of a rapid, intense, and equal heat to effect the perfect fusion of the materials, and to drive off the gas; during which time the unfused particles and excess

* Paper read at a meeting of *The Institution of Civil Engineers:* from *The Athenæum*, Aug. 18, 1840.

of salts are skimmed off as they rise to the surface. The progress of fusion cannot be resorted to, lest the intensity of heat requisite for the production of a perfectly homogeneous glass should be diminished, the quality of the product being influenced by any inattention on the part of the fireman, as well as by the state of the atmosphere or of the wind. It has been ascertained, that there is a certain point or crisis of fusion at which the melted metal must be kept to insure a glass fit for optical purposes, and even when that point be attained, and the crucible shall furnish proper glass during several hours, should there be such diminution of heat as to require the furnace to be closed, the remainder of the metal in the crucible becomes curdy and full of striæ, and thus unfit for use. It is the same with the glass made for the flat bore tubes for thermometers, which are never annealed, because the smoke of the annealing furnace would render the interior of the bore unfit for the reception of the mercury. These tubes will only bear the heat of the blowpipe when they are made from a metal which has been produced under all the favourable circumstances before described. It is, therefore, to be inferred, that the most homogeneous and perfect flint glass can only be produced by exposure to an intense and equable degree of heat, and that any excess or diminution of that heat is injurious to its quality. The English method of manufacturing the flint *plate* for optical purposes is thus described:—

About 7lb. weight of the metal is taken in a ladle of a conical shape from the pot at the proper point of fusion, and then blown into a hollow cylinder, cut open, and flattened into a sheet of glass of about 14 inches by 20, and varying in thickness from ⅛ths to ¼th of an inch. This plate is afterwards annealed, and in this state goes into the hands of the optician, who cuts and grinds it into the requisite form. When a glass furnace is about to be put out, whole pots of metal are sometimes suffered to remain in it, and cool gradually. The crucibles being destroyed, pieces of glass may be cloven from the mass of metal, softened by heat, and made to assume the requisite form, and then ground. It is believed that the excellent glasses made by Frauenhoffer, and other manufacturers on the continent, are produced by some such means. On attempting to cut glass ware, it is easily perceived if it be sufficiently annealed; if not, the ware is put into tepid water, which is heated, and kept at the boiling point during several hours; it is then suffered to become gradually cold. This method is more efficacious than re-annealing by the ordinary means. A piece of unannealed barometer tube of 40 inches in length being heated and quickly cooled, contracted only $\frac{1}{16}$ of an inch, whereas a similar piece, annealed by the usual means, contracted nearly ¼ of an inch. Unannealed flint glass, being heated and suddenly cooled in water, exhibits the appearance of a mass of crystals; it is thence inferred that the process of annealing renders the glass more compact and solid; it thus becomes incapable of polarization.

Flint glass being remarkably elastic, has caused it to be used for chronometers. To prove its elasticity, a hollow ball of unannealed glass of 3 inches diameter, weighing about 16 ounces, was dropped, *when cold*, from a height of 7 feet upon a stone floor; it rebounded uninjured about 3½ feet, but broke on falling to the ground after the rebound. Similar balls, both at a *bright* and *low red heat*, were dropped from the same height, and both broke immediately without any rebound; thus demonstrating that its elasticity only exists while cold. Glass being sometimes deteriorated in the process of reheating, not only in color, but in its faculty of welding, by the sulphur existing in the coal or coke used in the furnace; this is prevented by occasionally throwing about a quart of cold water on the fire; the explosive vapour thus raised carries off the sulphureous gas. The process of annealing has the remarkable property of carrying off from the glass the reddish tint imparted to it by manganese, and in large masses, not only the reddish tint disappears, but the glass sometimes becomes green or blue, probably by the action of the sulphureous acid gas from the coke. The reddish tint will however return, and the greenish one disappear, should the annealed glass be afterwards heated or remelted. Should the pot crack during fusion, and the flame or smoke come in contact with the melted metal, a green tint and abundance of dense striæ will be the consequence. Such an accident can only be repaired, if the crack be accessible, by throwing cold water on the exuding metal, which thus becomes gradually cooled, and itself forms a lute, so as to enable the process of melting to be continued. Long experience has shown that the best fuel for melting glass in the furnaces is oven-burnt coke mixed with a small quantity of screened coal.

Mr. Pellatt illustrated the preceding paper by specimens of glass exhibiting peculiar effects of crystallization; among them were cylindrical solid pieces of flint glass, which, from being suddenly cooled by plunging them into water, had the interior entirely dislocated, and were merely held together by the exterior coating; portions of tubes showing the same effect; a portion of a vase of white glass dipped into blue glass of a greater density—in cooling, the interi

white glass appeared to be crushed by the contraction of the exterior coating; a similar vase of white and blue glass of more equal density had cooled, and bore cutting without cracking; a mass of optical glass, exhibiting striæ, specks, and imperfections; which he explained together with the modes of manufacture.

SYMPATHETIC INKS.*

The name of sympathetic ink has been given to liquids which, when used for writing, do not, at first, leave any perceptible trace of the characters described,—which can be made to re-appear only by aid of chemical agents.

Sympathetic inks were formerly often employed in secret correspondence; for this purpose, between the lines written with ordinary ink, a second letter existed, visible only to the person written to, who was previously instructed as to the method of making the characters re-appear.

Various salts are indicated in chemical works as possessing this property. We may here give a few details on this subject:—

SYMPATHETIC INK WITH HYDROCHLORATE OF COBALT.

This ink consists of an aqueous solution of muriate of cobalt, of a light rose color, with which characters, which become invisible, are traced, and which, when the paper is slightly heated, appear of a blue color, afterwards gradually disappearing on cooling, and re-appearing by heat.

Muriate of cobalt, mixed with muriate of iron, yields a liquid which may be similarly employed; the characters, instead of blue, appear of a green colour.

SYMPATHETIC INK WITH ACETATE OF LEAD.

Characters traced with acetate of lead become visible when the paper is exposed to the action of sulphuretted hydrogen gas: these characters do not disappear.

SYMPATHETIC INK WITH SULPHATE OF IRON.

Characters traced with a solution of this salt, diluted with water, become visible on contact with a solution of the prussiate of potassa, or gallic acid. For this purpose a sponge steeped in a solution of prussiate of potassa, or gallic acid, is passed over the paper on which the characters have been traced. In the first case the characters appear of a blue color, in the second, black.

SYMPATHETIC INK WITH SULPHATE OF COPPER.

This ink was invented by Dr. Wurzer. Characters are traced with sulphate of copper, and made to re-appear of a blue color by holding the paper over a vessel containing volatile alkali. Thus is produced writing of a very beautiful blue.

* *Journal des Connaissances Necessaires et Indispensables*, May, 1840.

GILDING WITHOUT MERCURY.*

M. Delarive, inventor of the process of gilding without the use of mercury, by electro-chemical action, (for which see *The Chemist*, No. VI., p. 180,) sent to M. Arago several silver and brass watch-cases and other articles gilt on his plan.

"The operation," says M. Delarive, "was performed by M. Droin, of the firm of Bautte and Co., closely following all the descriptions of the process, as pointed out by me. The success evidently is complete. However, I am persuaded that the improvements introduced by M. Bergeon have the effect of producing thicker and, probably, more durable coats of gold.

"M. Droin has made some curious observations concerning the influence of the state of the surfaces, and of the homogeneity of the metal. He has observed, that the color of the gilding varies according to the nature of the metal operated on, all other circumstances being similar. Thus, Tyrolese brass took a gilding of a pure yellow color, and common brass, one of a reddish yellow. Rough surfaces are gilded as easily as smooth ones, as may be seen from the samples which I send."

LIGHTING-GAS FROM TURF.†

From several public journals it appears that M. Pahlenz of Grunsberg in Silesia, has made trials of the employment of turf for lighting, and that he affirms that 1000 turfs of 8 inches square, and 4 in height, were sufficient for lighting 50 street lamps, for 8 hours. The residue then presents a good coke for forges.

* *Academy of Sciences*, Paris, sitting of July 6, 1840.

† *Journal des Connaissances Necessaires et Indispensables*, May, 1840.

III. PHARMACY, &c.

MEDICAL REFORM.—PROPOSAL TO FORM A DRUGGISTS' ASSOCIATION SIMILAR TO THE BRITISH MEDICAL ASSOCIATION.

In a report made to the British Medical Association (given in *The Lancet*) of an interview between a deputation from that Association, and Mr. Warburton, which took place on the 25th of July, an expression is used on which we feel it our duty to make a few observations. After mentioning some of the principal provisions of the bill, the Report proceeds to say that "there are to be no provisions for preventing grocers, *chemists, druggists*, or empirics, from tampering with the public health, and interfering with the regular practitioners." If it succeed in preventing APOTHECARIES from "tampering with the public health," by drenching their patients with an unnecessary quantity of medicine, it will, in our opinion, perform very great service, and will be hailed with joy by all parties. This evidently is a direct INSULT to druggists: although it is complained that they "INTERFERE with the regular practitioners," yet no mention is made of the INTERFERENCE of the "regular practitioners" with the druggists. May we ask the writer of the above-mentioned Report if, in the proposed Medical Reform measure, it is contemplated to prevent surgeons and apothecaries from keeping OPEN SHOPS and SELLING DRUGS, as well as from TICKETING—from UNDERSELLING the chemists and druggists,—from PUFFING and ADVERTISING their nostrums,* and many other equally *dignified* practices resorted to by innumerable members of their degraded profession? Will it abolish the PER-CENTAGE SYSTEM? And, though last, not least, will it reform the present TRULY ABSURD SYSTEM of Medical Education?†

In the hope expressed in the concluding sentence of this very *liberal* Report,—that the association will be aided by the public as well as medical men in the just and laudable endeavours to render the profession more *respectable* among themselves, and much more *useful* to society,—we heartily join; considering that these are by far the most sensible objects they can have in view, and that they will require every assistance to enable them to accomplish so difficult a task. The respectability of the profession is indeed at a very low ebb, and its utility to society is very much in want of improvement. The division of the medical profession into its proper branches, alone can effect these objects.

The Public also is very deeply interested in any alterations and amendments in the medical profession; we therefore ask its assistance in securing such a system of Medical Reform as shall protect it from being drenched with medicine to satisfy the culpable cupidity of the apothecaries, and from ignorance.

We trust that the druggists will lend us their assistance in obtaining redress of their grievances. They should call MEETINGS in London and OTHER LARGE TOWNS, and ORGANISE their PLANS: they might even form an Association similar to the British Medical Association, to carry out their views. Such an association would, we feel convinced, immediately be thronged with members, and would be too powerful to be successfully resisted. To it we would cheerfully lend very efficient assistance: our pen should always be in readiness to aid it in its endeavours to obtain that which is due both to the druggists and the public.

We beseech chemists and druggists to act on the above suggestion, and we think there is no reason to doubt success. Our great object is to obtain a division of the branches of the medical profession, in which chemists and druggists will take up their proper position,—an object which will be obtained if the measures we propose be adopted—certainly not without.

There is no time to be lost: the meetings, if called, must be called AT ONCE:—we are sure they would be very numerously and respectably attended.

We suspend further comment for the present, but will resume the subject, and go more deeply into it, in our next number, by which time we hope to see the druggists take some decided measures, and begin the work in good earnest, and that they will no longer submit to "the oppressor's wrong."

* This practice, to the disgrace of the whole profession, is adopted by some of its HIGHEST members.

† In the remark of Dr. BARLOW, at the meeting of the British Medical Association, that educational reform is the proper basis of all others, we entirely concur.

MEDICAL REFORM AS RELATES TO DRUGGISTS.

To the Editors of The Chemist.

GENTLEMEN,—A degree of shortsightedness has marked the character of the virulent attacks which have of late appeared in medical periodicals, against the chemists and druggists, that betrays a great want either of justice or reflection. All sorts of unfair practice,

in the way of prescribing, is alleged against them, and the immediate interference of the legislature solicited to prohibit it. I am much surprised at all this, because it is evident that whatever evil exists is entirely attributable to the surgeon-apothecaries themselves, who drive the public into the hands of the chemist, by their own ill-judged method of seeking remuneration for their services.

When legislative interference is sought with a body of men whose capital is embarked in trade, it ought at least to be shown that they are acting in a manner opposed to the wishes of the public; but in this case it is quite the reverse, as it is the public who seek to avail themselves of the chemist. Men think little of paying 6*s*. 8*d*. to a lawyer for his advice, but grudge it for a bottle of medicine. The root of the evil consists in the prescriber making his profit by sending medicine in large quantities at a high price, instead of taking a direct fee for his opinion, and writing a prescription: he thus defeats his own object—for his patients lose sight of personal attainments, and attribute everything to the remedial agent—consequently, they prefer paying a low price to a chemist for a pill and draught, to a high one to the apothecary. Let the surgeon-apothecary limit himself to prescribing only, and his character will stand much higher in the eyes of his patient; it will also remove all desire for competition on the part of the druggist, whom interest will then instruct to avoid all kind of responsibility, by reference to the general practitioner.

It would not, indeed, be very difficult to show, that all legislative enactments to prevent chemists from prescribing, without the above plan be pursued, must be UTTERLY FUTILE, as nothing can stop a druggist from attending to his private customers when they seek his aid in all simple cases, unless the inducement is taken away by his having the prescriptions (which in justice belong to him), as an equivalent. As to the assertion that we attempt to treat really serious cases, it is preposterous, because, if maltreatment really occurred, any chemist is of course amenable to law, yet notwithstanding the hostility of apothecaries, there is no such case on record.

I cannot conclude without remarking that a striking proof of the SUPERIOR accuracy of druggists' dispensing, is shown in the fact of young men, educated in the business, being in almost all cases preferred in the public hospitals — AT APOTHECARIES' HALL ITSELF — and in hundreds of private surgeries.

I am, Gentlemen,
Your constant reader,
A LONDON CHEMIST.

August 7th, 1840.

[Not only has a degree of shortsightedness, but also a degree of wilful and culpable misrepresentation and falsehood, pervaded the attacks lately made on chemists in certain medical journals. Every attempt is made forcibly to restrain chemists from prescribing, while the apothecary is to be upheld in selling drugs, and, as a natural consequence of such a system, the patient must be drenched with medicine, in order to remunerate his medical attendant for his services. If druggists will be true to themselves—if they will support us in our endeavours to obtain for them that of which, otherwise, they may unjustly be deprived—if they will be unanimous and unremitting in their struggles for justice, we doubt not but they will secure the DESIRED OBJECT.]

SALE OF DRUGS BY IGNORANT PERSONS.

To the Editors of The Chemist.

GENTLEMEN,—I was much pleased with some observations in your last Number, respecting the disgraceful practice of TICKETING adopted by certain individuals styling themselves surgeons, &c. Druggists really have much to contend with, especially in country towns, where almost every grocer and small shopkeeper is a retailer of drugs: they have no knowledge of quality, —cheapness is the only merit their articles possess; and we know there are houses in London who will supply drugs and chemicals at any price. I will give one instance, out of many, to show the ruinous effect on our trade. Pulv. potass. supertart. is worth, to buy, about 100*s*. per cwt.: one of my neighbours, a grocer, is selling it at 10*d*. per pound. I asked him how he could afford to sell under the market-price: he told me that he ordered it at a certain price, which left him a good profit; thus leaving quality quite out of the question.

We have, also, on the market day, people having drug stalls in the market vending their nostrums to the great injury of our trade. Now, I would ask, how can a druggist, whose pride it is to furnish the purest articles, contend with such a system as this? I hope the London and country druggists will not suffer the Medical Reform Bill to pass without calling the attention of the Legislature to the danger and impropriety of allowing ignorant persons to sell drugs.

I trust these few observations may be the means of arresting the attention of some more talented correspondent, and that with your assistance the best method of obtaining redress may be pointed out.

I am, Gentlemen,
Your obedient Servant,
H. STORY.

Hadleigh, Aug. 13, 1840.

NECESSITY OF CHEMISTS' APPRENTICES PAYING MORE ATTENTION TO THE STUDY OF CHEMISTRY.

To the Editors of The Chemist.

GENTLEMEN—I do not think you could better advance the interests of Chemistry, than by devoting a portion of your valuable magazine to the encouragement of a spirit of inquiry and a taste for experimental chemistry amongst the chemists' apprentices, the generality of whom are in a lamentable state of ignorance, as regards the science of chemistry, and every thing that does not fall under the daily routine of retail trade.

I trust, gentlemen, you will pardon the liberty I have taken in thus drawing your attention to this subject: it is a deep sense of the advantages which would result, were scientific chemistry, and the chemistry of the druggist more intimately connected, that has induced me to offer these few remarks.

I am, gentlemen,
Your obedient servant,
AN APPRENTICE.

Chelsea, July 29th.

[We agree with "An Apprentice" in his opinion of the importance of chemists' apprentices acquiring more information than that which concerns retail trade only. They are indeed, in many cases, utterly destitute of any knowledge of the nature and properties of the drugs they serve, knowing nothing of them but their price. As we have some very important observations to make on the system of apprenticeships, pointing out its many inconveniences and abuses, and its utter unfitness for teaching the sciences and arts,—we will resume this subject in a future number. Want of space compels us to dismiss it for the present.]

SALE OF POISONS.

To the Editors of The Chemist.

GENTLEMEN,—I feel glad that my letter on the sale of poisons in your last number has attracted the notice of some of your correspondents, and, notwithstanding the attempt made by "A Subscriber" to throw ridicule on my suggestions, (which attempt you have shown to be truly ridiculous), I feel myself justified in reverting to the subject again, as one of very great importance both as regards the public and the druggists. I am borne out in directing public attention to the matter, in consequence of the alarming fact, that out of about sixty suicides which occurred during last month, twenty are stated to have been through taking poison. Surely such a dreadful sacrifice of human life loudly calls for legislative interference; it fully corroborates the opinion I before advanced, that there is too great a facility afforded the public in procuring poisons, and we are morally bound to do all we can to counteract this growing evil.

I trust, gentlemen, that this deeply interesting subject will meet the full consideration it is entitled to from your numerous and scientific readers, and that some satisfactory and effectual plan may be devised and introduced into the forthcoming Medical Reform Bill.

I am, gentlemen, yours respectfully,
Aug. 12, 1840. J. T.

[J. T.'s suggestion could not, we think, very easily be carried out to the fullest extent: it would be utterly impossible to insist on the presence of a witness in all cases. Poisons are sold to entire strangers, for manufacturing purposes, without that precaution being taken, yet but few accidents occur through this indiscriminate sale of them. Nevertheless, we recommend its adoption when practicable. Many druggists find it utterly impracticable,—others, very free from inconvenience. We think it our duty to attend to every suggestion relating to so important a subject. Want of space this month constrains us to postpone any farther observations on this subject to another opportunity.]

ON VARIOUS ADULTERATIONS OF LACTATE OF IRON.*

BY M. LOURADOUR.

In the March No. of the *Journal de Pharmacie*, I described a process for preparing crystallized lactate of iron (see *The Chemist*, No. V. page 160). Since that time, having had occasion to examine various samples of that salt, I have detected several adulterations practised with the aid of the pulverulent form; under which many manufacturers have thought it should be sold, and I hasten to make my brethren acquainted with them.

In some of these samples I have found sulphate of iron in the efflorescent state, or precipitated by alcohol; in others, starch or sugar of milk.

Nothing is easier than to detect the first of these adulterations by means of nitrate of baryta, which precipitates all the sulphuric acid of the sulphate of iron.

For the second, tincture of iodine presents an extremely active re-agent.

The third is less easy to detect, sugar of milk and lactate of iron being equally soluble in water, and insoluble in alcohol and ether. I succeeded, however, by means of nitric acid, which converts the sugar of milk into mucic acid. About two grammes of

* *Journal de Pharmacie*, July 1840.

the suspected lactate of iron may be heated with thirty grammes of nitric acid, until the whole be reduced to about six or seven grammes. If the salt be pure the liquor remains clear after cooling: if it contain lactine, a white pulverulent precipitate of mucic acid is formed, the characters of which may easily be recognised.

Doubtless these adulterations may be guarded against by testing pulverulent lactate of iron before using it; but the simplest and most secure way is to employ it only when under the form of crystalline plates, which will not allow of adulteration.

ON THE DANGER OF EMPLOYING LEECHES WHICH HAVE ALREADY BEEN USED.*

BY DR. PUCHE.

Many medical men having lately adopted the method of applying leeches even to the centre of inflamed ulcers, whatever may be their nature, and the high price of these reptiles inducing many persons to sell again those which have already been used—we have thought it right to mention the ill effects likely to result from such practice, of which the following observations, which we insert entire, in order to give the facts all their weight, furnish a striking example.

A young man, aged twenty-four years, was admitted into the *Hôpital du Midi*, for urethritis of four months' standing, which latterly had become complicated with acute epididymitis and syphilitic ulcers on the abdomen. He had been in the habit of once a week visiting the same woman, and had had connection with another, eight days before the appearance of the urethritis; he felt confident, he told me, of the good conduct (*des mœurs*) of his mistress, with whom he had lived for a long time, whom he had since seen, and who had not been ill: he attributed his condition to the woman whom he had but once visited. Four months after, in consequence of hard work, without the running having stopped, he was seized with epdidymitis of the left side, for which a great number of leeches was applied on the hypogastric region. Five of these leeches, which had been bought at a low price by a nurse, made punctures which inflamed and assumed the appearance of chancres. Having experienced but little relief, the patient then presented himself at the hospital for admission.

At this time, February 28th, 1840, the urethritis, which, for a long time, had not been painful, yielded a small quantity of a whitish pus: the ulcers spread very much, and were greatly irritated, and the inflammation of the epididymus was very intense. I immediately inoculated the running matter, as well as the pus from the ulcers, and applied emollient cataplasms to the testicle. *Usual diet; bathing.*

On the fourth of March, the inoculation of the urethritis had produced nothing, and that of the chancres gave a syphilitic pustule. The inflammation of the epididymus, which was the chief cause of the patient coming to the hospital, was totally abated. I commenced a mercurial treatment by the red sulphuret of mercury, in the dose of five centigrammes per day in a pill, dressing the leech-bites, with ointment of sulphuret of mercury.

On the 6th of March, the syphilitic pustule was profoundly ulcerated; the edges were hard, and it sunk in the middle. *A decigramme of mercury in two pills.*

On the 11th of March, the dose was increased to fifteen centigrammes; on the 14th, to two decigrammes; on the 18th, to twenty-five centigrammes; but the day after so large a dose of mercury had been administered, the patient complained of pains in the stomach and slight vomitings. I then suspended the use of the mercury, and purged him.

In the mean while the ulcers on the abdomen proceeded to cicatrization, and on the 25th of the same month, were entirely closed. For a few days following, I gradually increased the dose of the mercurial salt, until it amounted to five decigrammes.

The secretion from the urethra had in no wise diminished under the influence of this treatment. At the commencement of the month, I had tried, without success, injections of nitrate of silver, in the dose of a decigramme in one hundred grammes of distilled water. These injections irritated the canal to such an extent that I was obliged to desist from using them. I hoped that after the therapeutic inflammation, the running would cease, as is generally the case; but it was not so, and on the 15th of April, after five days' remission, I prescribed the use of cubebs in progressive doses, passing each day to one of the following terms:—ten, twenty, thirty, forty, fifty, sixty, seventy, eighty, ninety, a hundred grammes, and thus re-descending from a hundred to ninety, eighty, seventy, sixty, fifty, forty, thirty, twenty, and ten grammes.

When we arrived at forty grammes in the ascending progression, this medicine gave rise to violent colics, followed by abundant evacuations which soon stopped, beginning again, however, an hour after each dose of the cubebs; but the treatment being continued the patient was better able to bear it,

* *Journal des Connaissances Medicales*; July, 1840.

and the abdomen remained only a little freer. At the same time, general symptoms were manifested: the skin was hot and dry, and exhaled a powerful odour of cubebs. The patient said he felt flushes of heat rise to his face: he experienced fits of giddiness accompanied by a sensation of weight, as if his head were unwieldy, and as if he could not balance it. I arrived at fifty grammes of the cubebs, in the descending progression without the running from the urethra appearing modified, and as in administering this substance, the general treatment had been continued, I thought that the exciting action of the mercury had kept up the irritation of the canal. I suspended its use, and from that time, although the patient took only very small doses of cubebs, the running daily decreased, and entirely ceased by the 6th of May. The other symptoms had long since been cured. The cicatrix of the ulcer resulting from inoculation remained only a little indurated.

REMARKS.

The clearly hunterian form of the ulcers which were developed after the application of the leeches would be sufficient to demonstrate their syphilitic nature: however, I wished to confirm my opinion by a proof which ought to be regarded as infallible, and from which I at the same time expected a certain indication by which to determine the mode of treatment to be adopted. I inoculated the pus and I obtained a fine pustule regularly developed, terminating in an indurated and cupreous cicatrix, such as frequently is seen after chancres of the skin.

To what cause can the appearance of syphilitic ulcers on the abdomen be attributed, except to the application of leeches which have before been on that part? Could it be from the connexion he had had, four months previously, with the woman from whom he got the urethritis? This could not be supposed, because primitive ulcers have never been known to appear so long after infection. Could it be attributed to the disease of the urethra, the matter of which had infected the leech bites? No, for the secretion was inoculated without success, a few days after the appearance of the chancres, and at the same time that the latter were inoculated. Indeed, the inflammation of the epididymus, which so frequently complicates blennorrhagia, but which was never known to supervene from a syphilitic discharge, confirms our opinion concerning the nature of this urethritis.

It must, therefore, be acknowledged that these ulcers arose from the bites of the leeches previously employed in a syphilitic disorder, and which carried the infection from one subject to another: in our opinion this transmission is very possible: but we feel that new facts are required, to render it more manifest. In our practice we will carefully note every thing which has a tendency to elucidate this subject; and at the same time we will examine a few secondary points, such as whether the leeches perish under the influence of the virulent principle which they have imbibed, whether this principle concludes by being dissipated, and in what time it disappears.

POISONING BY THE SWEET-PEA (LATTYRUS ODORATUS).—TREATED BY OXIDE OF ZINC.†

BY M. PUEL, OF FIGEAC.

The *lattyrus odoratus*, a leguminous plant, is very common in the south of France. Its beautiful colors and agreeable odour have acquired for it a place in our gardens. No one hitherto has recognised poisonous properties in it. The following fact, however, proves that it may occasion symptoms analogous to those caused by acro-narcotic vegetables.

On the 20th of July 1837, I was called in to a lady who exhibited every symptom of poisoning. In the absence of physicians I was obliged to render immediate assistance. The following are the observations which I made of the case:—

The pulse was strong and gave 120 pulsations: the pupil was much dilated: the eyes sunk; the tongue and lips were purple and swelled; the face very deeply colored; the veins of the neck full and prominent; the lower extremities cold.

The husband of the lady, being interrogated as to what had caused this state, gave me the following information:—

In the morning, at nine o'clock, Madame B—— had prepared and taken a cup of chocolate; she went into the garden, where she gathered a bouquet of sweet-pea, which she put in her mouth. Soon after, she set out with her husband to return to their residence in our town. Half an hour after their departure she felt a pain in the throat, accompanied by excessive thirst; she attributed this to the excessive heat of the day, but it gradually increased to the end of their journey. The patient could not articulate a word: she had almost entirely lost the use of her senses. I was then called in. I requested to be shown the bouquet which Madame B—— had carried in her mouth during her walk; it was composed of ten branches of sweet-pea. The total weight was about 24 grammes; the lower part of

† *Journal de Chimie Médicale*, August 1840.

these branches was chewed for a third of its length. I attributed the symptoms which the patient experienced to the properties of this plant; and I proceeded to combat them, from the symptoms and from analogy, as I should have done in a case of poisoning by belladonna.

TREATMENT.

At one P.M. an anti-spasmodic draught of 150 grammes, in which I put seven decigrammes of oxide of zinc: sinapisms to the lower extremities. At three o'clock the improvement was evident: Madame B—— had recovered the use of her senses; she articulated a few words; she complained of violent pains at the back of her head and at the epigastrium: lemonade with tartaric acid was given her as a drink. At six o'clock, a general bath. The improvement continued: she was able, on coming out of the bath, to walk about her room. The night was rather disturbed, and sleep painful. Next day the patient was well enough to go out.

Were the symptoms experienced the result of poisoning by an acro-narcotic vegetable? In this case would poisoning have been produced by the sweet-pea? I do not pretend affirmatively to resolve these two questions; but I think it right to take notice of this fact, in order that caution may be used until experiments shall determine the true properties of the *lattyrus odoratus*.

RESTORATION AFTER DROWNING BY THE ACTION OF VOLTAIC ELECTRICITY ON THE PHRENIC AND EIGHTH PAIR.*

BY DR. FERGUSON, SURGEON TO THE WESTMEATH INFIRMARY.

On Thursday evening, the 18th of June, I was requested to see James Rock, who had just been taken out of the canal, and was supposed to be dead. I was with him in four or five minutes. I forthwith had him removed to the County Infirmary, about 900 yards distant. Several persons said that he was six or seven minutes under the water, and that he had been intoxicated. Finding the abdomen very much distended, I immediately introduced the stomach-pump, and discharged by it upwards of a gallon of water, strongly impregnated with spirits. All the ordinary means of restoring animation failing, I tried a plan which I have long considered likely to bring about the action of the heart and lungs, by immediately acting on the diaphragm, and accordingly was prepared with the necessary apparatus. I made an incision below the seventh rib—cut down on that important muscle—laid it bare, and applied the conductors of a galvanic battery, consisting of fifty pairs of plates, to it. The effect was instantaneous, and surprised all the persons present. The muscles of the chest and abdomen became spasmodically engaged; after a few moments, I could see this spasmodic action gradually disappear, and the regular action of the chest come on, which soon increased till breathing became quite apparent, as also the circulation; and blood, now for the first time, issued from the wound I had made in the chest.

He has continued to go on well, under the use of the lancet, and the antiphlogistic treatment; and I have no doubt of discharging him, cured, very shortly.

This case will also go to prove, in my opinion, that it is not necessary to transmit along the *channel of the nerves*, this most wonderful agent, as a substitute for nervous influence.

The stomach-pump was of much use, as by relieving the great distension of the stomach, the lungs were better able to fulfil their function, upon the galvanic influence being applied. In cutting down and exposing the diaphragm, much caution is necessary, not to wound it, however slightly, the consequences of which might be very bad.

* From the *Dublin Medical Press*, July 1, 1840.

SULPHATE OF ZINC AS A VOMITIVE.†

BY M. TOULMOUCHE.

The employment of sulphate of zinc as a vomitive is not a new discovery; indeed, most authors have recognised it as such when it was required to evacuate, but at the same time to give tone to the stomach. Its use has been recommended in apoplexy consequent on indigestion,—in poisoning by narcotics,—in cases when a spider has been swallowed—in asphyxia from sinks, wells, &c.—against bilious fevers, when other emetics have proved unavailing—and in hysterical debility. Quercetan, Juncker, Fothergill, Crueger, Fischer, Lettsom, and many other practitioners have used it in the various maladies which we have enumerated.

M. Toulmouche, of Rennes, has lately made numerous experiments on this salt as a vomitive, and from his clinical experiments, he concludes:—

1st, That sulphate of zinc in the dose of 10 centigrammes exerts hardly any vomitive action:

2nd, That in the dose of 20 centigrammes

† *Journal de Chimie Médicale*, August 1840.

it causes, in most cases, from one to two vomitage, and in two-thirds liquid stools:

3rd, That in that of 30 centigrammes it almost always causes vomiting, and purges only in about half the cases:

4th, That in that of 40 centigrammes it gives rise, in four cases out of five, to vomiting, and in the fifth to purgation:

5th, That in the dose of 50 centigrammes this salt, in two cases out of three, provokes vomiting:

6th, That 60 centigrammes always causes vomiting:

7th, That in the dose of 75 centigrammes it determines vomiting in only one-third of the cases, and purgation in the remaining two-thirds:

8th, Finally, that, in more than one-third of the cases, sulphate of zinc gives rise to colics, in general, not very violent.

REMARKS.—Lemery, in his *Cours de Chimie*, page 520, has described this salt under the name of *vomitive vitriol*. He has added to its use a note which we think worthy of insertion here:—

"The patient, after the effects of the vomitive, passes off by stool, matter as black as ink, because it frequently happens that some portion has found in the stomach a substance with which it combines, and a black substance is formed, similar to a mixture of vitriol with nut-galls.

However, it remains to be known whether sulphate zinc, Lemery's vomitive vitriol, was pure, or contained sulphate of iron.

ON PAULLINIA, A NEW MEDICAL SUBSTANCE.*

Dr. Gavrelle has lately published a notice concerning a new substance called *Paullinia*. This substance is extracted from a plant of the same name, brought from Brazil, and prepared by the Indians, and which appears to be possessed of a very energetic exciting action. Dr. G. has presented a sample of it to the *Société de Medicine*, as well as a new alkali which two chemists in Paris have separated from it by analysis. The extract and the alkali are very bitter, and are somewhat analogous to cafeine.

It is probable that the Paullinia, or the extract which bears its name, is procured from certain plants of the genus paullinia, (Octandria Tryginia), which consists of thirty species.

The products procured from the various kinds of paullinia, whose name is derived from these plants, having been dedicated to Simon Paulli, a medical botanist, who was born at Rostock in 1603, and died at Copenhagen in 1680. This learned man was author of several works, and particularly of *Quadripartitum de Simplicium medicamentorum facultatibus*, 1668, in 4to; of a work on the abuse of tea, tobacco, &c.

The *Paullinia Africana* is employed in Senegambia to stop flux of the blood; its bark, in powder, is applied to the affected parts. The bark of the *Paullinia Asiatica* is used at Bourbon as a febrifuge; in India the bark, leaves, and fruit, are used as a decoction, which is prepared with four grammes of these products, in venereal affections, in rheumatism, gout, and cutaneous diseases.

The seeds of the *Paullinia cupana* are used by the Indians of Oronoko; they mix them with cassava and water, leave them together, and when the mixed liquid begins to putrify, and acquires a yellow color and a bitter taste, they strain it and mix it with their common drinking water.

The *Paullinia Mexicana* possesses, according to Hernandez, the properties of sarsaparilla.

The seeds of the *Paullinia pinnata* are stupifying; at Brazil and the Antillæ they are used for intoxicating fish. The leaves of this species of paullinia are vulnerary, according to Pison. The *Paullinia serjania* also furnishes intoxicating seeds.

Finally, according to Martius, with the extract of the *Paullinia sorbilis* is prepared the product known in Brazil by the name of *guarana*—a medicine compounded by the Indians of Para, who give it the form of a sausage weighing from 125 to 250 grammes.

The color of guarana is brown; the mass is formed of lumps, which are not of so deep a color as the guarana at its surface. This product is hard, light, and inodorous; its taste is rather bitter, without being astringent. Gomez asserts that guarana is used in Brazil against dysentery, and in diseases of the urinary passages by relaxation, in doses of from four to eight grammes, in a glass of water. According to M. Batka, guarana contains a vegetable alkali—*guaranine*.

Dr. Gavrelle gives the following details concerning the species of paullinia which he has frequently used: he says that it is extracted from the *Paullinia sorbilis*, whose fruit resembles the cacao in colour: odour, *sui generis*, and a bitter taste, analogous to that of ratanhia.

It is prepared by separating the seeds from the capsules; they are exposed to the sun until the tegument may be separated by mere pressure; it is afterwards triturated and reduced to a fine powder.

M. de Chastitus found in it gum, starch, and a resinous matter of a reddish brown; a fat oil, tannin, and a crystallizable sub-

* *Journal de Chimie Medicale*, July, 1840.

stance, possessing the chemical properties of cafeine.

In Brazil and in the neighbouring countries, its powder is mixed with cacao, and given in diarrhœa and dysentery, and as a tonic. Having brought it into France, Dr. Gavrelle has successfully used it in cases of chlorosis, long convalescence, phthysical looseness, headache, &c.: its use is the same as that of guarana.

MODE OF ADMINISTRATION.

From numerous and very carefully conducted experiments, it has been concluded that preference should be given to the hydro-alcoholic extract, as the most rational preparation, and as most accurately representing the properties of the plant.

PAULLINIA LOZENGES.

R. Hydro-alcoholic extract 21 gr. 3 decigr.
Sugar with vanilla ....560 gr.
Ft. *secundum artem*, lozenges of 6 decigrammes.

SYRUP.

R. Hydro-alcoholic extract ....10 gr.
Aromatic syrup.....1000 gr.
The dose may be carried to 14 grammes per day.

PILLS.

R. Hydro-alcoholic extract ....Q. S.
Make into pills of a decigramme each, with a sufficient quantity of liquorice.

POWDER.

R. Paullinia.....4 gram.
Aromatic syrup .....16 gr.
Mix.

TINCTURE.

R. Hydro-alcoholic extract ....32 gr.
Alcohol at 22° .....500 gr.

OINTMENT.

R. Hydro-alcoholic extract.....8 gr.
Lard .....64 gr.

ANTICEPHALALGIC PILLS OF DR. BROUSSAIS, IN CASES OF OBSTINATE HEADACHE.*

R. Extract of belladonna Extract of hyosciamus	ā ā	gram. 0·00
Extract of lettuce . . .		1·00
Aqueous extract of opium .		0·21
Butter of Cacao . . .		8·00

F. S A. sixty pills.

Dr. Broussais recommends these pills in cases of inveterate headache, in the dose of one pill morning and evening.

* *Journal de Chemie Médicale*, June 1840.

TO CORRESPONDENTS.

T. L. S.—Camphor, when confined in bottles, and particularly when placed in the window, is, by the heat, gradually evaporated, and the vapour, being condensed, deposits on them the crystals we observe, and it is a curious fact, that they are always found in greatest abundance on that part which is nearest the sun. The other question is quite out of our province.

"A London Chemist," and J. T. may have the space they request.

Will "A Country Soap Boiler" send us his name and address.

Mr. Wasnidge shall be answered in our next.

We regret being prevented, this month, by want of space, from noticing THE DRUGGISTS' PROVIDENT ASSOCIATION, to the benevolent and laudable objects of which, we give our hearty approval. A notice of it shall appear in our next.

"A CHEMIST AND DRUGGIST NEAR LEEDS."—Sulphate of Copper, Arsenic, Sesquicarbonate of Ammonia, and Prussiate of Potassa, may be procured from Messrs. EVANS, BROTHERS, Red Lion Wharf, Upper Thames Street, London: we have always found their articles very good, and their prices very moderate.

Q.—We think J. H. was perfectly right in exposing the errors in Dr. Thomson's Conspectus, and that his animadversions were well merited. If they occurred only in the first edition, that is no excuse. J. H. *has* given the means of rectifying them, and, as every one who has the first may not go to the expence of the second edition of Dr. T's. otherwise very useful work, we think that in doing so he has done a service to the profession.

Want of space compels us to omit answering many of our correspondents of this month: those, therefore, whose questions are not answered, will find replies in our next.

Second Editions of No. I., II., and III. are ready, and may now be had of our Publishers, and may be ordered of all Booksellers and Newsmen throughout the kingdom.

NOTA BENE.—*All Communications and Books for Review must be addressed, "To the Editors of The Chemist, care of Mr. Hastings, Publisher, 13, Carey-street, Lincoln's Inn Fields, London." Communications must be pre-paid, and sent before the 15th of each month.*

STEWART AND MURRAY, PRINTERS, OLD BAILEY.

THE CHEMIST.

I. CHEMISTRY.

ON AFFINITY OR THE POWER OF COMBINATION.*

BY M. H. AZAIS.

In nature a single motive cause produces all kinds of motion: that cause is EXPANSION. By the uniform action of that one force, every body, whatever its dimensions and its position in space may be, is perpetually endeavouring to spread its whole substance into a greater space, and, consequently, to drive away the surrounding bodies. But, in its turn, it is subjected, at its surface, to the equally expansive reaction of those surrounding bodies, so that expansion, considered in the whole of the universe, always keeps in exercise two general acts, balanced by one another—one for the purpose of dilating every body from its centre towards its circumference—the other, for that of condensing every body from its circumference towards its centre: the first, the immediate source of the phenomenon of heat; the second, the immediate source of the phenomenon of gravity. Between these two phenomena—the only immediate and absolutely simple—the only fundamental ones,—are placed the phenomena of mixed constitution, or in the production of which the two fundamental phenomena exercise different degrees of influence. Among these, AFFINITY is one of the most multiplied and most important. Guided by experiment and principle, we are about giving a definition and an explanation of it.

This word, *affinity*, adopted by philosophers, is of a metaphorical nature, borrowed from human relations; but its applicability having consecrated it and having rendered it technical, it shows how figurative the language of positive sciences may be, without being inappropriate to the subjects which it should express: a simple but striking evidence of the unity of nature.

With the philosopher, affinity is *molecular gravitation*. Like gravity, or central gravitation, it is a reciprocal action between the bodies which exert it. Such is their essential point of resemblance. But this action being, as we have said, a phenomenon of mixed constitution, it has also essential points of resemblance with heat; since, like it, it is exerted only on contact, and it is indefinitely variable in its intensity, whilst gravity does not bring in contact until after it has begun to act at a greater or less distance, and until, on the other hand, the gravity of all the bodies gravitating towards the same point, that, for example, of all the bodies deposited on the surface of the globe, is absolutely the same. Besides, ponderable bodies, in becoming attenuated, and in being divided, are ultimately liberated from the action of gravitation, by being rendered imponderable. Then, on the contrary, they are more subject to the action of heat, and that of affinity.

The tenuity of bodies, then, is a condition necessary to the exercise of affinity. But this condition is not sufficient, since, among bodies attenuated to a degree that renders them imponderable, some have a great tendency to combine: others, on the contrary, have but little tendency to do so, or are even repulsive of one another.

In molecular bodies, what is this condition of existence which so much favors their reciprocal gravitation, or renders it so much more, or so much less difficult? To find it, let us be present, in idea, at the first appearance of an imponderable molecular body, which we know to be eminently susceptible of affinity.

A globule of light from the sun arises from that star; it is by divergent expansion that it is projected; consequently, it

* A Memoir read to the *Académie des Sciences*, Paris, August 10th, 1840.

is in a state of dilatation which arrives at independence. But, at the precise instant of evasion, it encounters the universal irradiation, the constant product of general expansion, at once independent and mobile, because it is perpetually renewed, because all its elements, coming from all points of the universe, are ever in the most vivid and the most rapid contrary motion, and, in obedience to the laws of expansion—a necessarily uniform power—always have a tendency to be distributed into space; which leads them to encircle, unite, press and contract the surface of all bodies which impede their uniform distribution.

But the luminous globule, itself a focus of expansion, like all bodies in nature, and a very powerful one, being overtaken by a powerful, sudden contraction, suddenly reacts against it, is dilated to the same degree of oppression as it has just undergone, rushes on in its turn, to the agents of this oppression, which agents retire only immediately to return to the charge, in order to press, and, *de novo*, to contract the globule, which also again reacts, is dilated, again provokes contraction, and immediately repels it,—in a word, it is constituted in a state of continued vibration, which it retains during its passage through space, because there, and especially when at liberty, the universal irradiation penetrates, crosses and envelopes all the bodies not yet reduced to the tenuity of its elements, presses and contracts them, and provokes their expansive reaction.

Every subtile radiation, traversing space, is therefore ever alternately in submission to, and in domination over, universal radiation, which renders each of its rays intermittent. Thus is the theory of Newton, Laplace, and Biot, concerning the propagation of light, reconciled with that of Euler, Fresnel, and Arago: both are true. The emission of subtile fluids, by way of radiation, and the undulation, or, more accurately speaking, the continued vibration of each of their rays, are two inseparable facts.

Moreover, Newton, in observing and calculating *the alternate fits of easy reflection and easy transmission of light*, had already given an experimental and mathematical demonstration of its constant state of vibration. Latterly, the microscope has shown that this state of constant vibration is equally essential to the particles detached, by maceration, from vegetable or animal organic fibres, and from the debris of inorganic bodies, such as glass, granite and porphyry, finely powdered. Indeed the most important physiological act testifies that man, and all beings of elevated species, manifestly and perpetually obey this power of vibration. Every one respires, that is to say, is alternately dilated and contracted, and every one is constituted a respiring being, as the luminous globule is constituted a vibrating body; the human child, for example, expansively springs from the bosom of its mother, consequently in a state of dilatation. But, from the moment of its evasion, it is encircled, pressed and contracted by the atmospheric fluid: it cries, reacts, and is put with the same fluid in a permanent alternacy of subjection and preponderance.

Everywhere, in the universe, periodical pulsation is effected, sustained, impresses life, and characterises it. Thus, life is one of the essential, universal fruits of universal expansion; it is the greatest phenomenon of mixed constitution, perpetually produced by the continued balance of the two fundamental phenomena, two primordial general actions, one of which incessantly acts in dilating bodies,—the other, in condensing them,—and which, in nature, are always retained in equilibrium.

There is the most important mystery at once elucidated. The mechanism of affinity has now to be explained. We are about to glance at the direct agent of vital nutrition, respiration, and generation, and of all organic acts, all of which are acts of vibration, and of affinity.

Every molecular body, we say, perpetually vibrates. But is the amplitude of vibration of molecular bodies always the same? that cannot be; for the most of these bodies is indefinitely varied, and principle and experience show us that the smaller a molecular body is, the more rapid should be its vibration, for its obedience to the expansion which dilates it, and to that which contracts it, can be only so much the more prompt, as less matter is presented to this double impulsion. It is also evident that every elastic body of appreciable dimensions, an organ pipe, for example, which the percussion of the wind passing through it renders sonorous, vibrates with a swiftness which is accelerated in proportion to the diminution which its length or diameter are made to undergo.

Let us now repeat that the unique and universal force — expansion — is necessarily, by itself, a power uniform in its action; consequently, it incessantly tends to distribute matter and motion uniformly into space. We also see that water and all liquids—caloric and all subtile fluids—are ever endeavouring uniformly to occupy all the points of space allotted to them.

But this universal tendency towards uniformity becomes slow and difficult when applied to molecular bodies, proceeding from different sources, and very dissimilar among those of mass and vibration. If, on the contrary, projected towards the same space, these molecular bodies are equal in

mass, and consequently, isochronal in vibration, the power of uniformity has but to intermix them equally and gently; its work is accomplished without confusion or disorder; no effort renders it perceptible.

Between these two extremes, the one, of perfect homogeneity, engendering languor and monotony; the other, of very considerable heterogeneity, engendering very great difficulty, there is evidently an indefinite number of intermediate terms, to each of which corresponds a more or less advanced degree of facility in the action of the power of uniformity.

What term of heterogeneity least resists this power of uniformity, or is best disposed for reciprocal combination? It is evidently that of two orders of molecular bodies constituted in such a manner that some make only one vibration, whilst others, twice as small and twice as numerous, make two vibrations in the same space of time: there, manifestly, are found the relations most favourable to harmony.

And if, in another binary group, the relations of mass and vibration are represented by the numerical relation of 2 to 3, the reciprocal combination, a little less prompt, is yet established with much facility. If the simplicity of the relation of the vibrations be still farther diminished—if it be represented by that of 3 to 4—the combination will become still less rapid: however, it will be easy.

But if the relation of the respective vibrations continues to deviate from mathematical simplicity, if it comes to be representable only by numerical relations gradually more dissimilar, such as 13 to 17, 19 to 33, 42 to 65, in such conditions, the power of uniformity will encounter a gradually increasing difficulty; ultimately it will be able to overcome it only by time and efforts.

That which we have just traced is a view of acoustics. If two orders of sounds, emitted in the same space, are in relations of mathematically simple vibrations, their combination is prompt and easy, and it produces *harmony*. If, on the contrary, the relations of their vibrations are dissimilar and confused, there will be irregularity and discordance, instead of combination and concert.

But is this view of sonorous concurrences at the same time that of chemical concurrences?—Undoubtedly. Indeed, the most harmonious musical affinity, and that most easy to obtain, is that of its tonic with its octave; and, in order to produce these two sounds in concurrence, two sonorous bodies must be struck together, one double the size of the other, for this reason one making only one vibration, while the other makes two; for this reason, also, the molecular emission of the first, half as rapid, but twice as deep, being necessarily half as numerous, being extended over a space half as great.

Now, in chemistry, the most complete reciprocal affinity, that most easily obtained, is that of two masses of gas, one oxygen, the other hydrogen, produced at the same time, by the two poles of the same Voltaic pile; and, of these two gases, whose magnetic equilibrium is strictly accurate, one, the hydrogen, is however twice the volume of the oxygen; which shows that its production has proceeded with twice as much rapidity, or that its components have twice as much tenuity. The relation of the two gases, then, is the same as that of the two octave sounds with one another; the facility of fundamental affinity in chemistry, is therefore explained by the same cause as the facility of fundamental affinity in music; the tonic gas—oxygen—has hydrogen for its octave; and thus is the demonstration completed.

In chemistry, if in a binary compound, such as acetic acid, hydrogen be eliminated and replaced by oxygen, a new compound is obtained, essentially similar to the preceding compound, but whose chemical properties are more distinct. In music, if in a binary harmony, a fixed sound be taken as the basis—the sound *sol*, for example, and if it be combined, at first, with the sound *ut*, an octave higher, afterwards with the sound *ut*, carried an octave lower in the first case, a fourth, *sol-ut*, is produced, in the second, a fifth, *ut-sol*. These two chords play the same part in harmony, only the harmony of the fifth is firmer and more consonant.

From such a similitude between facts of paramount importance, flows a theory common to chemistry and music. The following is a summary of it:—

In chemistry, as in music, the act of reciprocal affinity in its perfect degree, is the immediate fruit of perfect concordance, of concordance according to the relation of 1 to 2, between the vibrations of molecular bodies thrown into the same space. From this term, from this the most simple relation, the reciprocal affinity between molecular bodies is gradually weakened, in proportion as the relation between their respective vibrations diminishes in mathematical simplicity. When this relation has become dissimilar to a certain degree, there is no more reciprocal sympathy, no more affinity: each of the bodies which it is sought to combine, is so much the more opposed to it as, especially in chemistry, in which the motions have much less quickness than in music, each molecular body, repelled or delayed, necessarily finds, in its vicinity, other molecular bodies whose vi-

brations agree with its own; it in preference attaches itself to those which most easily attach to it.

Hence follows this law of general experiment:—THERE IS NO EASY SUCCESS IN ANY KIND OF COMBINATION EXCEPT FROM THE SIMPLICITY OF ITS COMPONENT PARTS.

Let this axiom guide us in the study of the facts of which nature is composed; it can have combined them only in their most simple relations. On their side, the most simple relations only can be the most general. Now, in very compound works, absolute unity is the supreme degree of affinity; it is therefore to the absolute unity of the principle which produces all the facts, and of the law which governs all their relations, that the most extended, the most compound, the most universal work owes its stability and harmony.

The investigation of this principle and of this law has, for fifty years, occupied my mind; and I am persuaded that it has not been in vain. It appears to me incontestable that expansion is the principle of all movements, and that the law which regulates the exercise of it is the continued balancing of all the effects of expansion. Every great particular discovery is but one of its developments. We may mention a striking and recent instance.

At one of the sittings of the academy, last month, heavy geological and historical documents, confirmed through M. E. Biot, the expansive theory of heaving up (*soulevement*): a theory which represents the terrestrial globe as being agitated, since its origin, by a desire to extend itself indefinitely into space, and of exploding! Why has this not happened? What exterior resistance reduces it to being able to make only difficult efforts? Above it, and around it, there are nothing but globes, and they are very distant.

But, like the earth, all these globes are expansive and radiating; but from their continued radiation round the earth, a contrary irradiation, which presses the terrestrial surface in every direction, contracts, condenses it, renders it hard to swell, to heave, and to open, allowing only the subtile radiation, emanating from the centre, to pass with facility, which radiation, in its turn, assists in the repression and preservation of the surrounding globes.

Thus, it is by their reciprocal conflict that the neighbouring globes are of mutual assistance to one another! A simple and salutary combination! Let our globe be liberated; let it overcome by its own expansion the surrounding expansion, what would it become? What, on our earth, one people conquering all the others would become,—it would instantly be dissolved.

EXPANSION IN EQUILIBRIUM! such is the term for this great enigma; it answers to all kinds of phenomena, since it expresses the initial impulse which is the origin of all kinds of motion.

Let the human mind, if desirous of comprehending every thing, take this principle for a guide; it will proceed with clearness and with firmness in search of universal truth. No more groping in the dark, no more vague and uncertain hypotheses. Necessarily, what the principle explains it makes certain; every investigation which it directs can lead only to demonstration, or indeed to evidence.

This it is that attaches my conviction to the Memoir which I have just read. Every thing flows from expansion in equilibrium.

ON THE PROPERTIES AND CHEMICAL CONSTITUTION OF COAL, WITH REMARKS ON THE METHODS OF INCREASING ITS CALORIFIC EFFECT, AND PREVENTING THE LOSS WHICH OCCURS DURING ITS COMBUSTION.*

BY CHARLES HOOD, F.R.A.S., &c.

The author considers his subject under the three following heads:—

I. The chemical character and composition of coal:

II. Its properties as a combustible:

III. The nature and application of its various gaseous products.

I. The opinion that coal is a compound of carbon and bitumen has been objected to by some chemists, on the ground that by no process hitherto pursued in analyses has it been possible to resolve it entirely into these two substances: even at a low temperature a quantity of gaseous matter is thrown off, and at an elevated degree of heat an evident decomposition of the bitumen takes place. Even anthracite contains a small portion of volatile matter, its component parts being carbon, oxygen, hydrogen and nitrogen; the hydrogen being either combined with the oxygen to form water, or with a small portion of carbon to form carburetted hydrogen, which exists in a gaseous state in the pores of the coal. In bituminous coal, the hydrogen is combined with a larger proportion of oxygen and nitrogen; the mechanical differ-

* We select this article from several papers read before the Institution of Civil Engineers, on the 25th of August, and given in *The Athenæum*, No. 670. It is very creditable alike to the author's talents and reputation. Many of the remarks contained in it will be found of great practical value.

ence being, that the bituminous and free-burning coals (more particularly) melt by heat when the bitumen reaches the boiling point, whereas anthracite is not fusible, nor will it change its form, until it is exposed to a much higher degree of temperature. Two tables of the analyses of different coals are given from the authorities of Mushet, Thomson, Vanuxem, Daniells, Ure, and Regnault; No. 1 showing the proportions of carbon, ashes, and volatile matter, with the specific gravity of the coal and of the coke; and No. 2 showing the proportions of carbon, hydrogen, azote, and oxygen. These tables show that the largest quantity of carbon (92·87) is contained in the Kilkenny anthracite, and the least quantity (64·72) in cannel coal; and that the nature of the volatile matter greatly affects the quantity of coke—the aggregate quantity of the gaseous products of coking, splint, and cherry coal, being very nearly similar; while the quantity of coke obtained from these different species varies more than 45 per cent. The author then pointed out the continual presence of nitrogen, which quits the base with the greatest difficulty; and also the affinity of sulphur, not only for the coal, but for the coke, as it is rarely found to have been completely expelled even from the most perfectly made coke; the only coal found to be even partially free from it being anthracite, in some species of which no traces of its presence are found.

II. The application of coal as a fuel depends on the chemical change which it undergoes in uniting by the agency of heat with some body for which it possesses a powerful affinity. In all ordinary cases this effect is produced by its union with oxygen. When coal is entirely consumed, the carbon is wholly converted into carbonic acid gas and carbonic oxide, and the hydrogen into water in a state of vapour. The atmosphere supplies the necessary oxygen for this purpose; and in this state the products of the combination are nearly or quite invisible, both of them being almost colourless fluids; if, therefore, any smoke be visible, it is the result of imperfect combustion. Some calculations are given to ascertain the amount of loss that is sustained when the smoke escapes unconsumed; from which it appears, that with bituminous coal about 37 or 38 per cent. more heat is produced when the smoke is consumed than when it escapes freely. Many modes of consuming smoke have been attempted; those which appear to have been attended with the greatest success are:—

1st. Causing the smoke from the fresh coals to pass through or over that portion of the fuel which is more perfectly ignited.

2dly. Supplying heated air to the top of the fuel, as well as admitting cold air through the ash-pit in the usual manner.

3dly. Throwing a jet of steam into the furnace or into the chimney.

The various modes of carrying these plans into effect are briefly alluded to: a few may be selected from them. Robertson's plan was to use inclined furnace bars, where the fresh coals were placed close to the fire-door, and being there partially carbonized, gave out the gas which in passing over the mass of incandescent fuel was ignited, and became active flame, thus economizing fuel and preventing smoke. In this and similar cases, by the slow distillation of the coal, a gas is produced, which not only inflames at a lower temperature than the dense olefiant produced by rapid distillation, but which only reqires for its combustion a quantity of oxygen, never exceeding double its own volume, or ten times its bulk of atmospheric air, while olefiant gas requires three times its own volume of oxygen, or fifteen times its bulk of atmospheric air. The elimination of a gas which burns with so small a portion of oxygen is, therefore, the principal cause of the non-production of smoke in furnaces of this description.

The second plan of consuming smoke is founded on the necessity which exists for a large supply of air being requisite to inflame the gases given off from coal by a rapid and intense heat; and this is accomplished by introducing a quantity of heated air above the burning fuel. When a quantity of fuel is thrown into a furnace, the increased thickness of the mass opposes additional resistance to the passage of air through the bars; the temperature of the furnace is lowered, and an increased volume of gas is at the same time given out. If at this moment a quantity of air, heated to the temperature of the gas, be admitted, the gas immediately inflames, and that which would have produced a dense black smoke passes off in the invisible state of carbonic acid gas and vapour of water.

Different gases require different degrees of heat to inflame them; and this explains the easy combustibility of the volatile products of coal when the heat is so managed as to produce those gases which inflame at the lowest temperature. A larger quantity of air is required at the time that the coal is first thrown on, than at a subsequent period; therefore, when economy is studied, the supply of air should be gradually diminished as the mass approaches an incandescent state. The use of heated air has produced most important results in the manufacture of iron with bituminous coal, and also with anthracite; the latter fuel having been almost neglected until the recent application of this principle of employ-

ing heated air to promote its combustion, although it is known to be capable of producing perhaps a more intense heat than any other carbonaceous fuel.

The rationale of the third plan, of consuming smoke by injecting a jet of steam into the fire or the chimney, is less obvious than the others. In 1805, Mr. Davies Gilbert observed, that whenever the waste steam of one of Trevithick's engines was permitted to escape into the chimney, the smoke from the coal was rendered invisible. Subsequent experiments confirmed this fact; and it was supposed, that the steam being decomposed furnished oxygen to support combustion. The author combats this opinion, and accounts for the effect by the increased draught of the furnace caused by the jet of steam into the chimney, by which means a larger portion of air is brought into contact with the burning fuel; thus supplying the previous deficiency of oxygen to the fire, and promoting the combustion. As steam is only about half the weight of air at a like temperature, and the power of all gaseous fluids to ascend is "*inversely* as the square roots of their specific gravities," the velocity of its escape by the chimney, compared with common air of the same temperature, is about as 1·4 to 1; therefore the compound mixture of steam, air, and carbonic acid gas, will escape with a considerably increased velocity, and more air must consequently enter the furnace. It appears that about 10 per cent. of the total quantity of steam generated is necessary to effect the combustion of the smoke by this means; therefore, unless the waste steam only be used, the saving of the fuel must be reduced by this amount.

Brief mention is made of the experiments of Messrs. Apsley Pellatt, Parkes, and the Chevalier de Pambour, proving that a given quantity of oven coke will produce as much heat as the coal from which it was produced; and of the various kinds of artificial fuels which have been invented, especially that composed of resin and peat coke, of which the author remarks that its combustion probably produces a mechanical effect, as the hydrogen is converted into water in a state of vapour, which escapes through the chimney with a great velocity, and consequently a large quantity of air is drawn into the furnace, and a more perfect combustion of the fuel is the result. In the same manner he accounts for the necessity which exists for having the openings between the bars wider in a furnace in which coke is burned than in one used for coal. In opposition to the general opinion, he considers that less air is required for the consumption of coke than for coal; the carbon only requiring 2¼ times its weight of oxygen for its combustion, while the hydrogen contained in coal requires eight times its weight of oxygen: and the only reason that the openings between the bars are required to be wider in the former than in the latter case, is in consequence of the draught being so much slower during the combustion of coke.

III. 'On the nature and application of the volatile products of coal.'

In treating this portion of the subject—many of the observations on which have been necessarily anticipated in the preceding sections—Mr. Hood traces the application of carburetted hydrogen gas to the purposes of artificial illumination from the year 1798, when its first successful application was made by Murdock at Soho; he then proceeds to Dr. Henry's investigations of the phenomena of its production and combustion; the variation of the intensity of light obtained from carburetted hydrogen, due to the proportion of carbon contained in it; the difference in the gas obtained from different qualities of coal; the superiority of the illuminating power of the gas from cannel coal; and the still greater power of that produced from the decomposition of oil, which is 2 to 2½ times greater than that of coal gas. He then mentions the other products of coal by distillation, ammoniacal liquor, carbonic acid and oxide, sulphuretted hydrogen, tar, essential oil, naphtha, petroleum, asphaltum, and other substances. The paper concluded by pointing out the advantages which would result from the production of such gas as is usually given out at the beginning of the distillation of coal, as it contains 2 volumes of gaseous carbon united with 2 volumes of hydrogen, and its illuminating power is consequently more than double that of ordinary coal gas.

Mr. Parkes observed, that the quantities of air required for the combustion of different fuels as determined in the laboratory and on the large scale of practice, were frequently very different. It might be quite correct that a given weight of coal would require more air for its perfect combustion than the same weight of coke. There was great difficulty in ascertaining the fact practically, under steam-boilers, as the gases given out by the coal must have air supplied to them distinct from that which passed through the grate to ensure their perfect ignition, and many circumstances prevented the consumption of air from being exactly measured. Generally, he had found it necessary to use wider spaces between the grate bars for coke than for coal. In some late experiments very carefully made on a boiler invented by Mr. A. M. Perkins, equal weights of coal and coke required the same time for their destruction on the same grate, the apertures of the damper and ash-pit door, which were used to govern the

draught being precisely the same. Coke effected a greater evaporation than coal at similarly rapid and slow rates of combustion; and in every case the temperature of an oil bath at the foot of the chimney was higher with coke than with coal. It must, however, be remarked, that no process had been used to ignite the gases which escaped from the furnace uninflamed. He had tried different kinds of coke, coal, and anthracite at this boiler, and the same fuel in every instance performed a greater evaporative effect at a slow than at a rapid rate of combustion. He thought that much of the air which entered the grate of a boiler passed through the fire unconsumed, for want of time to effect a sufficiently intimate combination with the fuel.

In some experiments lately made at Swansea on the properties of anthracite, Dr. Schafœutl had found from analysis, that no less than 40 per cent. of the products of combustion taken from the chimney consisted of oxygen, yet he had effected the large evaporation of 11 lb. of water with 1 lb. of that fuel.

ON MYRRHOID, A NATURAL EXOTIC SUBSTANCE, RESEMBLING MYRRH, AND ON MYRRHOIDINE, THE PECULIAR PRINCIPLE WHICH IT CONTAINS.*

BY M. L. A. PLANCHE.

This substance made part of a collection which I procured, about two years since, from a druggist in Paris, and which he had himself chosen from a quantity of myrrh, so much was he persuaded that the selected pieces were the purest myrrh. Indeed, its resemblance to that gum resin must be very exact for a merchant, in the daily habit of seeing this drug, to be deceived; and that out of forty pieces which I tried, thirty-five were found to be false myrrh. For my own part, I must confess that I partook of the error: I should still have persisted in it, had it not been for a particular circumstance, which led me to examine things more closely.

Destitute as I was of any information concerning the origin of this natural product, I designated it *myrrhoïd*, because it is especially in its form that it resembles myrrh, and likewise to distinguish it from other false myrrhs.

Myrrhoïd, like myrrh, is presented in irregular drops: some are striated, of a fawn color, slightly opaque, and covered with a greyish dust: these are most numerous; others are of a reddish brown, more transparent, with a vitreous fracture, and are less rough externally than the preceding. Myrrhoïd, which has been long in contact with myrrh, retains a little of its odour; but it becomes inodorous, if, after having brushed it so as to remove the external dust, it be steeped in weak alcohol, and then exposed to the air for several days.

Myrrhoïd has a bitter, disagreeable taste, partaking a little of that of myrrh, but very acrid and peppery, which remains long in the mouth. Its powder is inodorous and of a yellowish white.

ACTION OF WATER ON MYRRHOID.

One part of powdered myrrhoïd triturated in an agate mortar with fifteen parts of water, gave an almost transparent, very slightly colored solution, from which, by settling, was separated a yellowish, soft substance, B, which did not dissolve in a fresh quantity of cold water: in the above-mentioned case it formed $\frac{3}{100}$ of the myrrhoïd: farther on we shall see, in treating of the direct action of alcohol, that it exists in it in larger quantities.

One part of powdered myrrhoïd (100 grains), triturated in an agate mortar, with two parts (200 grains) of water, yielded an opaque homogeneous mass of a mucilaginous consistence, which was diluted, always triturating, with about thirty parts of cold water: the almost transparent, slightly colored, liquor soon exhibited a multitude of small oleiform drops, which ultimately combined in a mass at the bottom of the vessel, having the appearance of a liquid resin, to which we shall soon recur, and which did not dissolve in a large quantity of boiling water.

Above it another prodigiously light and very bulky matter was held in suspension, giving to the liquid the appearance of a weak solution of gum tragacanth. I was unable to determine its quantity. This matter appeared to me analogous to tragacanthine.

If, instead of triturating the powdered myrrhoïd with water, the latter be left to act tranquilly for ten or twelve hours on the myrrhoïd, the solution is effected as above; but instead of the small portion of insoluble matter combining into a soft mass, it is presented in light flocks, floating in the liquid when stirred, and settling in it when allowed to stand. It may be remarked that myrrh, under the same circumstances, acts quite otherwise. The aqueous solution of myrrhoïd is very bitter and sour; it reddens turnsole paper. It is rendered turbid by alcohol, which precipitates white flocks from it, leaving the supernatant liquor perfectly clear and colorless. It is also rendered turbid by exposure to heat or the solar rays, and remains opaque until the evaporation is finished, leaving a yellow, dry, translucid matter, which again forms, with cold water, a limpid solution. This aqueous solution of myrrhoïd is almost en-

* *Journal de Pharmacie*, August 1840.

tirely formed by a peculiar matter, which we will designate *Myrrhoïdine*.

The resinous matter B, such as we separated it, in some measure mechanically, contained a certain quantity of water, which constituted it in its hydrated state. In this state it is insoluble in a fresh quantity of cold water and in boiling water; it obstinately retains, notwithstanding repeated washings, the sour and bitter taste of myrrhoïd: it is soluble in five times its weight of absolute alcohol.

This matter B, insoluble in cold water, was dissolved in alcohol. This solution, when very much diluted with water, did not become turbid; when set to evaporate, it remained transparent, then, as the evaporation proceeded, little oily drops were perceived floating on the liquid, taking a resinous consistence in appearance, when they were brought to the dry side of the capsule. Dissolved in five parts of absolute alcohol, this matter reappears, on water being added to the solution, under the form of transparent drops, which caused this mixture not to appear turbid, but rather to assume the appearance of water into which a few drops of oil had been gently stirred with a tube.

The resin of myrrhoïd is not soluble in ether.

DIRECT TREATMENT OF MYRRHOID BY ALCOHOL.

Myrrhoïd, reduced to a fine powder, was exhausted by three successive decoctions in alcohol. The liquors, settled and filtered while warm, deposited nothing on cooling. Combined and evaporated at a very gentle heat, they left as a residue, a yellow transparent matter, extremely bitter and sour, of the consistence of turpentine, while warm: so capable was it of being drawn out when in this state, that by plunging into it, for the depth of one millimetre only, the extremity of a glass rod, this matter might be drawn out like melted glass. I have proved that a small mass of six centigrammes in weight thus gave a thread of more than two metres in length. In the flame of a candle it melted without inflaming and without smoke, like resins, and finished by turning black.

The matter obtained by alcohol is very bitter, but its bitterness is different from that of myrrh, to which succeeds a sour taste which remains for a very long time in the throat. When cold it is very soluble, without residue, in water, in alcohol and in ether.

It is the same matter as that which, under the treatment by water, we designate by the name of myrrhoïdine.

TREATMENT BY WATER OF THE RESIDUE OF MYRRHOID, INSOLUBLE IN BOILING ALCOHOL.

The portion of myrrhoïd, which had not been attacked by the alcohol, was heated to ebullition, with a sufficient quantity of water; it might likewise have been dissolved in a small quantity of cold water. The liquor was still farther diluted, in order to separate small portions of ligneous matter and siliceous sand, foreign to its composition.

This solution, being evaporated, left a residue which had the insipid taste of gum, without either a bitter or sour after-taste.

In equal weight the mucilage which it formed with water was scarcely so thick as that of gum Acacia. But if it be borne in mind that gum arabic, dissolved and dried, retains 17 per cent. of water, according to M. Berzelius, it will be seen that the two mucilages are very nearly similar.

Under the same circumstances, M. Pelletier has seen the gum of myrrh produce a mucilage thicker than that of ordinary gum. The gum of myrrhoïd renders oils miscible with water, in the same manner as gum-arabic.

When myrrhoïd is directly treated by boiling absolute alcohol, so as to take up every thing soluble in that menstruum, ten per cent. of myrrhoïdine is obtained: the remainder is gum.

When, on the contrary, alcohol is made to act only on the portion of myrrhoïd soluble in cold water, 7 per cent. only is obtained from it, and that is as it should be, the $\frac{1}{100}$ having been separated by the water. Whence it follows that the dried product of the aqueous solution of myrrhoïd is a kind of definite compound, represented by seven parts of myrrhoïdine and ninety-three of gum, and that normal myrrhoïd is composed of—

Myrrhoïdine	10
Gum, about	88
Tragacanthine, or foreign matter	2
	100

ACTION OF ETHER ON MYRRHOID.

Powdered myrrhoïd having, when cold, been stirred with ether, at the expiration of an hour, the latter is decanted. This ether, evaporated in the open air, left an oily matter, which soiled paper, like a fat oil, and the stain remained on the paper after exposure to heat, and did not extend farther: the paper again became dry, as if it had been impregnated with a resin. It will be seen that it can be neither a resin nor a fat oil, for this matter, which adheres to the fingers when the capsule is gently heated,

is completely dissolved in cold water, without impairing its transparency: it also dissolves in alcohol, and the alcoholic solution is not rendered turbid by water, in whatever proportion it may be added to it. I do not know any oil or resin possessed of these properties.

It was myrrhoïdine again which was here dissolved by the ether.

MYRRHOIDINE.

Myrrhoïdine has the appearance of gum-arabic: its taste is bitter and sour.

It dissolves in water as easily as does the purest gum. It is likewise soluble in alcohol and in ether. It readily enters into fusion.

Blotting paper steeped in it is stained as it would be by a resin; spread on sized paper, it gives it the brilliancy of a fine varnish.

Myrrhoïdine is very soluble in spirit of turpentine. Olive oil, cold, or heated to a temperature incapable of decomposing it, not having any action on this substance, it melts, but does not become incorporated with the oil, and sticks to the tube with which one may try to divide it. It may be ascertained that the oil does not retain any solution, by tasting the oil after it is cold, or by treating it with ether after having decanted it.

The aqueous solution of myrrhoïdine does not alter the color of turnsole or turmeric paper.

Sub-acetate of lead,
Nitrate of silver,
Muriate of tin,
Sulphate of copper,
} were without effect on it.

Sulphate of iron renders it slightly turbid.

With tincture of galls it became turbid, turned white, and formed a white precipitate, soluble in an excess of alcohol.

With a solution of pure tannin the same results.

Myrrhoïdine completely dissolves in liquid caustic potassa: the solution, on being saturated with nitric acid, became green and transparent.

Ammonia acted in the same manner as potassa.

If pure hydro-chloric acid be made to act, without heat, on the dried bitter matter, in proportion as the solution is operated, the acid assumes a yellow color, like that of Malaga wine, very soon passing to brown: a peculiar aromatic odour is disengaged.

The addition of water to this solution precipitates from the myrrhoïdine, under the form of glutiniform filaments. This deposit, washed, in order to separate from it the excess of acid, lost nothing of its bitter and sour taste: its solubility in water was very considerably diminished. This matter dissolves in absolute alcohol, as before; but by that same, as it had lost its affinity for water, this liquid rendered the alcoholic solution turbid, as it would have done a resinous tincture, or alcohol, charged with a certain quantity of essential oil.

Pure concentrated sulphuric acid, poured on powdered myrrhoïdine, dissolves it without disengaging sulphurous acid. This solution has exactly the same tint as black balsam of Peru. Diluted with water, it becomes turbid, passing to a dirty white, and soon deposits very light flocks of the same color.

Nitric acid dissolves myrrhoïdine without disengaging nitrous gas. The solution, which is of a light yellow color, is rendered turbid by the addition of a small quantity of water. Diluted farther, it again becomes limpid.

Soda, potassa, and ammonia, whether caustic, or in the state of carbonate, do not produce in it any appreciable effect.

ON ESSENCE OF BERGAMOT.*

BY MM. E. SOUBEIRAN AND H. CAPITAINE.

Our experiments on camphenes left us undecided as to whether the different products obtained by the distillation of the essence of bergamot, pre-existed in that essence, or were the results of decomposition.

The following observation tends to prove that essence of bergamot is composed of several essential oils, which are of different degrees of volatility, and which are unequally divided in the products. Essence of bergamot, obtained by pressing the zest, was distilled by the intervention of water, and dried by means of chloride of calcium: its density was about 0·869. Observed in a tube of 100 mm., it caused the plane of the polarisation of light to deviate $+25°$ ƒ. It was redistilled with water, and the products were collected in four portions. The essence first distilled had a rotatory power of $+45°$ ƒ: the next essence deviated $+38°$ ƒ: the third product had a deviation of $+21°$ ƒ: and the last had no power of rotation. The mixture of all the essences should have given a mean deviation of $+26°$ ƒ. Experiment, therefore, satisfactorily proves that essence of bergamot is composed of at least two different oils, one of which, more volatile, has a very great rotatory power, and the other, less volatile, has no action on the rays of polarised light.

In our work on camphenes, we had not analysed the essence of bergamot, and, ac-

* *Journal de Pharmacie*, August, 1840.

cording to very natural analogies, we ranked it with the essence of lemon and orange. However, M. Ohme has lately published in the *Annalen der Pharmacie*, analyses of this volatile oil, which gave him 7·098 of oxygen, per cent., which circumstance has induced him to consider the essence of bergamot as a hydrated essence of lemon. The numbers found by M. Ohme perfectly agree with the formulæ 3 (C^{10} H^{16}) + 2 (H^2 O).

0·2925 of the first distilled essence yielded us:—

Carbonic acid	0·890
Water	0·267
Or per cent.:—	
Carbon	84·98
Hydrogen	10·12
Oxygen	4·90
	100·00

The essence, which had furnished the preceding results, was submitted to distillation in a retort, by which means none but the most volatile parts were collected, which, in their turn, were analysed.

1st. 0·264 grammes of matter gave:—

Carbonic acid	0·814
Water	0·271
Whence	
Carbon	85·25
Hydrogen	11·38
Oxygen	3·37
	100·00

2nd. 0·2605 grammes of matter yielded:—

Carbonic acid	0·797
Water	0·270
Or,	
Carbon	84·59
Hydrogen	11·49
Oxygen	3·92
	100·00

These two analyses may be interpreted thus:—

1st. Essence C^{10} H^{16}	96·32
Water	2·70
Oxygen in excess	0·89
	100·00
2nd. Essence C^{10} H^{16}	95·59
Water	4·41
Oxygen	0·00
	100·00

A rectified essence of bergamot, which had not been divided into several products during distillation gave 6·07 of oxygen; indeed, the last product of distillation resulting from another operation, yielded 16·94 per cent. The following are the details of this experiment:—

0·310 grammes of essence (last product) yielded:—

Carbonic acid	0·819
Water	0·303
Whence	
Carbon	73·03
Hydrogen	10·83
Oxygen	16·14
	100·00
Or	
Essence C^{10} H^{16}	82·50
Water	12·26
Oxygen in excess	5·24
	100·00

These experiments, like those of M. Ohme, show that essence of bergamot contains a certain quantity of oxygen: they do not absolutely contradict the supposition of that chemist, that this oxygen is in the state of water. But they do not allow it to be admitted that this essence is entirely constituted by a hydrate. The numbers corresponding to an atomic formula obtained by M. Ohme, are true only for the essence on which he operated, and they would certainly have shown themselves variable, if M. O. had separately analysed the different products resulting from the distillation of the essence.

We are of opinion that essence of bergamot contains one or two oils of the order of camphenes (C^{10} H^{16}); a hydrate whose composition is unknown to us, and probably also a small quantity of an oxygenised essence, which, doubtless, is formed by absorption of the oxygen of the air. Indeed, M. Ohme found in the deposits from the essence of bergamot, a stearopten (Bergaptene, Ohme), which contains 67·9 of carbon 3·65 of hydrogen, and 24·45 of oxygen.

We have in vain tried to make the essence of bergamot take up a greater quantity of water. For this purpose, we boiled it with water, for forty-eight hours, in an apparatus which condensed the vapors and returned them into the distilling vessel. The essence, analysed after this treatment, gave, as before, 6·07 of oxygen per cent.

Anhydrous phosphoric acid gives the means of separating all the water which may be supposed to constitute the hydrated essence of bergamot. Indeed, this essence well dried and put in contact with flaky phosphoric acid, is strongly heated and becomes colored: if it be separated from the acid deposit, and distilled, an entirely colorless product is obtained, which has not the smell of bergamot, but which possesses one similar to that of terebene. The essence of bergamot, which had a power of rotation of + 40° *f*, before the action of the acid, after its transformation, had a rotatory power of but + 40° *f*, which, probably, would have

been altogether wanting, had we used a larger quantity of phosphoric acid.

This product possesses the property of combining with hydrochloric acid, but we have not been able to ascertain the composition of the liquid camphor which it forms.

The phosphoric acid used for depriving essence of bergamot of its water, combines with a portion of organic matter, and forms an acid of the class of the vinic acids (*phospho-bergamic acid*), which, like them, gives with lime, and oxide of lead, salts which are soluble in water.

The essence which results from the action of phosphoric on the volatile oil of bergamot, gave, by analysis, the following results:—

1st. 0·313 grammes of matter furnished:—

Carbonic acid . .	1·006
Water	0·324
Whence	
Carbon	88·86
Hydrogen . . .	11·48
	100·34

2nd. 0·297 grammes of matter yielded:—

Carbonic acid . .	0·955
Water	0·310
Whence	
Carbon	89·00
Hydrogen . . .	11·57
	100·57

It is the composition of citrene and essence of lemon.

M. Ohme found that essence of bergamot, into which he had poured hydrochloric acid, contained 7·69 of chlorine per cent. The results at which we arrived are different, which evidently arises from M. O. in distilling his camphor with water, in order to purify it, having decomposed the greater part of it.

0·427 grammes of camphor of bergamot, bleached by filtration with purified animal charcoal, gave:—

Carbonic acid . .	0·973
Water	0·354
Whence	
Carbon	63 00
Hydrogen . . .	9·19
Chlorine . . .	27.81
	100·00

A camphor isomeric with the camphor of lemon, should have furnished 33·5 of chlorine per cent: we shall not hesitate to acknowledge that such, indeed, is the composition of the camphor of bergamot, if we consider that the essence which is used for preparing it always contains a little oxygenised oil, and that, besides, the camphor of bergamot ought, like the liquid camphor of lemon, to lose part of its acid, with the greatest facility.

ACTION OF ANHYDROUS SULPHURIC ACID ON ACETIC ACID.*

BY M. MELSENS.

Acetic acid, treated by sulphuric acid, gives rise to sulpho-acetic acid, which in the crystallized state, is represented by

$$C^8 H^4 O^3, S^2 O^5 + 5 H^2 O.$$

MO being a metallic base, the anhydrous neutral salts are represented by

$$C^8 H^4 O^3, S^2 O^5 + 2 MO.$$

MEMOIR ON CHLOROXALIC ETHER AND ITS COMPOUNDS.†

BY M. F. MALAGUTI.

The author sums up the results of his labours in the following words:—

The hydrogen of oxalic ether may be completely replaced by an equivalent quantity of chlorine: the chloroxalic ether, which then results, produces oxamide, with liquid ammonia, and gives, with gaseous ammonia, chloroxamethane, in all respects resembling oxamethane. Under the influence of liquid ammonia, chloroxamethane is converted into chloroxalovinate of ammonia, from which may be obtained, by proper means, chloroxalovanic acid, which differs from oxalovinic acid in its containing chlorine instead of hydrogen. This acid may be obtained in the anhydrous state, by making alcohol act on chloroxalic ether, which may also give rise to the production of a peculiar acid, by the oxygenising action of the alkalies.

The most striking result of these experiments, in my opinion, is the preservation of the chemical properties of oxalic ether, after it has lost ten atoms of hydrogen, and gained ten atoms of chlorine. Truly, we are acquainted with other examples of such preservation, but they are drawn from reactions produced by the decomposition of the chemical particles of the substance examined, which might not be so decisive as a case in which there was no decomposition, but a simple modification.

Let any one examine the subjoined table, in which are laid down, comparatively, all the transformations of oxalic and chloroxalic ethers, and he will speedily be convinced that one of the series is but a repetition of the other.

I have not adopted the rational formula for oxalic ether, for I considered it useless

* *Compte Rendu de l'Academie des Sciences*, No. 8, Aug. 24, 1840.

† *Academy of Sciences*, Sitting of August 3, 1840, from *Comptes Rendus*, No. 5.

to do so. Whatever theory may be adopted for interpreting the constitution of oxalic ether, the resemblance between the two series will not be the less striking.

Oxalic ether and its derivatives.	Chloroxalic ether and its derivatives.
Oxalic ether $C^{12} H^{10} O^8$	Chloroxalic ether $C^{12} Cl^{10} O^8$.
Oxalovinic acid $C^{12} H^{10} O^8, C^4 O^3$	Chloroxalovinic acid $C^{12} Cl^{10} O^8, C^4 O^3$.
Hydrated oxalovinic acid $C^{12} H^{10} O^8, C^4 O^3, H^2 O$	Hydrated chloroxalovinic acid $C^{12} Cl^{10} O^8, C^4 O^3 H^2 O$.
Oxalovinates $C^{12} H^{10} O^8, C^4 O^3, B O$.	Chloroxalovinates $C^{12} Cl^{10} O^8, C^4 O^3, B O$.
Oxamethane $C^{12} H^{10} O^8, C^4 O^2 Az^2 H^4$.	Chloroxamethane $C^{12} Cl^{10} O^8, C^4 O^2 Az^2 H^4$
Oxamide $C^4 O^2 Az^2 H^4$	Oxamide $C^4 O^2 Az^2 H^4$.

ON THE PROTEINE OF THE CRYSTALLINE LENS OF THE EYE.*

BY M. J. MULDER.

This substance was discovered by Berzelius; according to that chemist, it forms 35·9 of the crystalline lens of the eye, and does not become, like albumen, a coherent mass, but a granular one. In other respects it has the same properties. This new product was obtained in the following manner:—

The crystalline lens was carefully separated from fifty bulls' eyes, washed, the cell torn away, and water was added; it was then filtered. The liquor, heated in the sand-bath, immediately coagulated, and precipitated clots. After desiccation, the bruised mass was submitted to the action of alcohol and water, and to ebullition; after that it was dried at a temperature of 130°.

Obtained thus, this substance is white, and enjoys all the properties of albumen; but it cannot easily be pulverized. When it was put, with a solution of potassa, into a silver vessel, the latter turned black, which shows that it contains free sulphur: it does not contain free phosphorus.

0·170 produced 0·001 of white ash.

The composition of the crystalline lens of the eye is as follows:—

Carbon	55·59	or 40 atoms.
Hydrogen	6·94	or 62 ,,
Azote	16·54	or 10 ,,
Oxygen	21·16	or 12 ,,

The quantity of sulphur is about 1 atom to 15 of proteine.

The substance of the crystalline lens dissolved in nitric acid, mixed with a solution of nitrate of iron, and precipitated by ammonia, yielded the same quantity of phosphorus as a muriatic solution of the same matter. Phosphoric acid arises from the phosphate of lime; after that the substance does not contain free phosphorus.

If the crystalline lens, when very dry, be introduced into sulphuric acid, it swells up, and is converted into a gelatinous and transparent mass, like the proteine of caseum, of fibrin, &c. By the addition of water, it contracts and gives a hard powder.

After various considerations, the author concludes by saying that it is beyond doubt that the principle of the crystalline lens of the eye is proteine, for it possesses the same composition and the same atomic weight as pure proteine of albumen, fibrin, caseum, &c.

* From *Bulletin de Neerlande*.

ON CHELIDONINE AND PIRROPINE.†

BY M. POTEX.

M. Potex has lately found, in the root of the *Chelidonium majus*, a true alkaloid (*chelidonine*) and a sub-alkaloid (*pirropine*) analogous to narceine and narcotine, to which the juice owes its color. By distilling this plant in flower with the root, with or without alkali, products having the narcotic odour of this vegetable are obtained.

In the distilled acid product, obtained without an alkali, formic and acetic acids are manifested: that obtained by the addition of potassa contained ammonia.

PREPARATION OF THESE TWO ALKALOIDS.

The dried root of the *Chelidonium majus* is reduced to a coarse powder, and twice boiled in alcohol: these infusions being distilled, are poured into a retort, an equal quantity of distilled water being added: the alcohol is removed by a fresh distillation. The residue is put in a capsule; by complete cooling, a soft resin separates from it; it is filtered, and the two alkaloids are precipitated from it by means of subcarbonate of soda. It is filtered a second time, and the precipitate is washed in cold water, and dissolved in alcohol boiling at 84°; it is filtered and left to cool. By operating thus, the greater part of the chelidonine crystallises; by the evaporation of most of the alcohol, the remainder does the same. The crystals thus obtained are washed with alcohol, in order to free them from all

† *Journal de Chimie Médicale*, August, 1840.

extractive matter. The supernatant and the washing liquors are evaporated at a gentle heat; pirropine then crystallizes with a small quantity of chelidonine: its crystals are in yellow plates; some portion is deposited on the sides of the vessel, in blackish disks.

It is well to observe that too small a quantity of this root should not be acted on, because the proportions of pirropine are so very minute. The greatest part is shown with an extractive matter, aqueous or resinous: this latter dissolves in dilute acids; it is precipitated from them by the alkalies, but it is uncrystallizable: it is more particularly combined with the soft resin, with which it forms, together with chlorophylle and a fatty substance, an union so intimate that it is very difficult to separate it. It appears that pirropine is found more especially in old roots.

In the young roots and plants, in the yellowish lactescent juice, it is more particularly united to the aqueous extractive substance.

PROPERTIES OF CHELIDONINE.

Chelidonine crystallizes partly in transparent tables, and partly in cubes and their varieties. In the crystalline state it with difficulty dissolves in hot alcohol and ether; it crystallizes in cooling. The concentrated acids, even with the aid of heat, act but slowly on it; nitric acid turns it yellow, and sulphuric acid black. The dilute acids form with it colorless salts, which easily crystallize, and have a very bitter and astringent taste. Chelidonine readily dissolves in the fatty and volatile oils, by means of heat: these solutions have a bitter taste.

The alcoholic solution exerts an alkaline reaction.

If we pour into a solution of acetate of chelidonine, tincture of galls, or basic acetate of lead, abundant white precipitates are produced. Tincture of iodine forms in it a precipitate of the color of kermes. Chromate of potassa precipitates it of a deep yellow color; chloride of gold, yellow, and dark red, the alkalies white, &c.

PROPERTIES OF PIRROPINE.

Pirropine crystallizes in stars, which are prisms united; these crystals are transparent and colorless. By cooling they lose their transparency, and become rather brown. The acids scarcely act on it when cold; by boiling they dissolve it, and assume a golden yellow or reddish color. If its crystals be put in contact with any powerful acid, they immediately acquire a fine fiery red color. These combinations are in great part soluble in cold water, and have a very bitter but sour and pungent taste.

Pirropine with difficulty dissolves in cold ether and alcohol, and easily when they are boiling. Fatty and volatile oils dissolve it when cold. On being heated it melts, burns, and gives rise to ammoniacal vapours. Tincture of iodine precipitates acetate of pirropine of a crimson color; chloride of gold, brown yellow; chromate of potassa, deep yellow; tartar emetic, chloride of iron, nitrate of protoxide of mercury, deuto-chloride of mercury, and nitrate of silver, whitish yellow. The alkalies form in it a white precipitate. Tincture of galls and basic acetate of lead, do not effect any change in it. The alcoholic solution has not an alkaline reaction.

Prior to the year 1824, M. Chevallier, while working in M. Vauquelin's laboratory, discovered the existence of a crystalline substance in the *Chelidonium majus*. This fact he announced to the Société de Pharmacie; at about the same time M. Godefroy also remarked the same thing. "The reason," says M. C., "that I did not continue my investigations on this subject, was, that my colleague, M. Godefroy, had advertised that his work would appear in the spring of 1825. I did not wish to enter into competition with this work; and since, M. G. having died, I lost sight of the subject, which had not been continued by that chemist."

ON THE MANNER IN WHICH ASPARAGIN ACTS UNDER HIGH PRESSURE.*

BY O. L. ERDMANN.

MM. Boutron-Charlard and Pelouze† have, as is known, observed the remarkable fact, that asparagin, dissolved in distilled water, is converted into aspartate of ammonia, under the pressure of two or three atmospheres. They indicated only, for the process employed in their experiment, that they used a glass tube sealed at each end, and which was opened *after cooling*. From this it results that the experiment was made at an elevated temperature. Now, M. Erdmann wished to ascertain whether the decomposition was owing to the pressure, or to the elevation of temperature. For this purpose, he used, in operating, at the ordinary temperature, a compressing apparatus, constructed on Œrsted's plan, and which gave a pressure of thirty atmospheres.

* *Journal für praktische Chemie*, vol. xx. p. 69.

† *Annales de Chimie et de Physique*, vol. lii. p. 101.

Solutions of asparagin in water, of various degrees of concentration, were put in glass tubes, closed at one extremity and open at the other, which were plunged at the open extremity in a vessel containing mercury. The latter was placed in the compressing apparatus filled with water, then the water in it was compressed until the pressimeter indicated a pressure of thirty atmospheres. The tubes remained for several hours subjected to this pressure. After opening the apparatus and removing the tubes, the asparagin was found unaltered; the solution did not precipitate the salts of silver and lead: put in contact with potassa, it did not disengage ammonia, and it gave by evaporation crystals of asparagin, with all its ordinary properties. It appears, therefore, that the conversion of asparagin into aspartate of ammonia, is an effect of heat and not of pressure. The author also made, on this occasion, some researches relative to the influence of pressure on other bodies which easily undergo metameric transformations, or have a composition similar to that of other bodies. In this view, he has made experiments on cyanate of ammonia, urea, grape sugar, cane sugar, starch, and tartaric and paratartaric acid; but none of these substances underwent any perceptible alteration under the pressure of twenty or thirty atmospheres, at the ordinary temperature.

EXAMINATION OF A WATERPROOFING LIQUID.

BY EDWARD BENTLEY,

Fellow of the Microscopical Society of London, and Operative Chemist to H. R. H. the Duke of Cambridge.

1st. It had an acid reaction, but I could not find any free acid.

2nd. No trace of any metallic salt was discoverable by any reagents.

3rd. Large quantities of alum were found in the liquid, which caused the liquid to redden vegetable blues.

4th. No salt of lime could be detected in the fluid, and the ascertained ingredients would preclude any idea of baryta, or strontia.

5th. Small quantities of vegetable matter existed in the liquid, but what that may be I cannot pretend to state from the analysis of the quantity sent.

6th. A white residue remained as a precipitate, which was recognized to be sulphate of lead.

From the above statement a clue may in some degree be found, to the manner in which substances act in rendering cloth waterproof; and, if I might hazard a conjecture, I should imagine that the cloth was first dipped into a solution of acetate of lead, and afterwards into a strong solution of alum; but whether the small quantity of organic matter contributes in any way to the same effect, I am unable to form an opinion; but perhaps its small amount might be considered by some a proof of its not acting any important part in the manufacture of waterproof cloth.

COMPOUNDS FROM INDIGO.†

According to Erdmann, when indigo suspended in water is subjected to the action of chlorine or bromine, several products are formed: when the fluid thus acted upon is distilled, a fluid product in minute quantity passes over with the solution, and collects under the fluid in the form of white scales, which Erdmann terms *chlorindopten*. It is easily melted and dissipated by heat; it resembles an ethereal oil; it is slightly soluble in cold, but more so in hot water. It dissolves in alcohol, and is precipitated from its solution by water. Its composition is $C_8 H_2 Cl_4 O$.

At the bottom of the solution which has been acted upon by chlorine, is found a reddish yellow body: when this is treated with water it dissolves, leaving a resin which may be termed *chloranil resin*. It may be purified when the reddish yellow matter is boiled in alcohol; on cooling, reddish yellow translucid crystals separate: these would appear to consist of two bodies nearly similar in character; the principal distinction lies in their somewhat different solubility in alcohol, and in the one containing twice as much chlorine as the other. They have therefore been termed *chlorisatin* and *bichlorisatin*. With bromine corresponding compounds are formed. Chlorisatin dissolves in potash, and forms a compound of potash and *chlorisatic acid*, the composition of which is $C_{16} H_5 N_2 Cl_2 O_4 + KO$. The acid cannot be isolated, but its atomic weight appears to be 2318. *Bichlorisatic acid* is formed with bichlorisatin and potash. *Chlorisatyd* separates from a solution of *chlorisatin* in hydrosulphuret of ammonia, in the form of a white precipitate. *Bichlorisatyd* is formed in a similar way.

† *The Athenæum*, September 5.

PETROLEUM OIL WELL.*

About ten years since, whilst boring for salt water, near Burksville, Kentucky, after penetrating through solid rock upwards of two hundred feet, a fountain of pure oil was struck, which was thrown up more than twelve feet above the surface of the earth. Although in quantity somewhat abated after the discharge of the first few minutes, during which it was supposed to emit seventy-five gallons a minute, it still continued to flow for several days successively. The well being on the margin and near the mouth of a small creek emptying into Cumberland river, the oil soon found its way thither, and for a long time covered its surface. Some gentlemen below applied a torch, when the surface of the river blazed, and the flames soon climbed the most elevated cliffs, and scorched the summit of the loftiest trees. It ignites freely, and produces a flame as brilliant as gas. Its qualities were then unknown, but a quantity was barrelled, most of which soon leaked out. It is so penetrating as to be difficult to confine in a wooden vessel, and has so much gas as frequently to burst bottles when filled and tightly corked. Upon exposure to the air it assumes a greenish hue. It is extremely volatile, has a strong, pungent, and indescribable smell, and tastes much like the heart of pitch pine.

For a short time after the discovery, a small quantity of the oil would flow whilst pumping the salt water, which led to the impression that it could always be drawn by pumping. But all subsequent attempts to obtain it, except by a spontaneous flow, have entirely failed. There have been two such flows within the two last years. The last commenced on the 4th of July last, and continued about six weeks, during which time about twenty barrels of oil were obtained. The oil and the salt water, with which it is invariably combined during these flows, are forced up by the gas, above 200 feet, into the pump, and thence through the spout into a covered trough, where the water soon becomes disengaged, and settles at the bottom, whilst the oil is readily skimmed from the surface. A rumbling noise, resembling distant thunder, uniformly attends the flowing of the oil, whilst the gas, which is then visible every day at the top of the pump, leads the passing stranger to inquire whether the well is on fire.

* From *Silliman's Journal.*

ELATERITE, OR FOSSIL CAOUTCHOUC.

M. Pelouze has ascertained that this substance, which occurs in La Vendée, has the same composition as Indian rubber, viz, $C^8 H^7$.

In this country it is accompanied by a sort of gum resin, which is sometimes red, sometimes yellow, and even greenish; transparent, insoluble in water, and corresponds in its characters with amber.

CHEMICAL ERRORS.

In our last number we quoted, from *The Athenæum*, a passage in which it is stated that M. Marchand had "refuted the experiments of Dr. G. O. Rees, who affirmed that he had detected titanic acid in the blood, mistaking silica for that acid." We now give, from the same journal, the following letter from Dr. Rees to the editor, with the remarks of the latter upon it:—

"In your paper (No. 667), you have inadvertently done me an injustice. The paragraph I allude to is entitled 'Chemical Errors.' Permit me, Sir, to state, that the existence of titanic acid in the blood, as shown by myself, has been confirmed by the experiments of Brunner, who detected it also in the blood of the dog. It is true, that the subsequent experiments of Marchand afforded him a negative result, and he presumed therefrom that the silica in the blood had been mistaken for titanic acid. This, however, is quite impossible, as may be seen by any chemist sufficiently interested in the question to note the blow-pipe re-actions which I published in the *Philosophical Magazine*. You will greatly favour me by inserting this note, as I am unwilling that a positive result, in which two observers agree, should be published as an error, on the single negative experience of M. Marchand, a gentleman who, though his opinion is entitled to great respect, may, very possibly, hereafter have occasion to modify his views.—I am, &c.

"G. O. Rees.

"Guildford-street, August 27."

"It is in the blow-pipe tests that the objection to the conclusion of the writer lies, the characters of the impure silica alluded to before the blow-pipe being almost identical with those of titanic acid. Marchand is not the only observer who has obtained a *negative* result. Berzelius, Thomson, Lecanu, Richardson, O'Shaughnessy, and all other chemists who have examined the blood, agree with Marchand."

II. CHEMICAL MANUFACTURES.

SPECIFICATION OF Mr. JOHN AUGUSTUS TULK'S PATENT FOR IMPROVEMENTS IN THE MANUFACTURE OF IRON.

The following is a detailed description of this invention, which we consider to be of much practical value. The novelty consists in the mode of applying glass, or the materials used in glass-making with hœmatites, and other rich iron ores, to the manufacture of iron in blast furnaces. We use nearly the patentee's own words :—

"According to the ordinary means now resorted to for the manufacture of iron, by smelting iron ores in blast furnaces, the description of ores known as argillaceous ores, are, and ever have been, those which have necessarily been employed, notwithstanding their being exceedingly poor of metallic iron, and it is only from the circumstance of the poverty of such ores, that the process now resorted to, can be worked with advantage in the manufacture of iron, by the use of pit coal, or coke, or anthracite; and such process of manufacturing iron from argillaceous ores, as now practised, is inapplicable to the making iron in blast furnaces from the rich ores or oxides of iron, known as hœmatites, found in Cumberland and other places; and such ores have only been used heretofore in the blast furnace, to a very small extent, in conjunction with poor argillaceous ones, and in some cases with the cinder of reverberatory furnaces used in the manufacture of iron. I believe that such rich ores or hœmatites have seldom, if ever, exceeded one-tenth of the ores in the blast furnace at one time; the quantity, however, may be more. Now, the nature of my invention is such, that iron may be made by the use of a blast furnace, wholly from the rich ores, or hœmatites, or oxides of iron; or such rich ores may, with greater advantage, be mixed in larger, and indeed in any desired quantities, with argillaceous ores, than could be practised by the means ordinarily pursued in reducing argillaceous ores with slight admixture of hœmatites.

It is well known to iron-masters, in the process of smelting argillaceous ores in blast-furnaces, that lime is used as a flux, and that the result of working, is first, the metallic or cast-iron (carburet of iron) and a glass or slag which is produced by the combination of the lime used as a flux, and the silica and other impurities of the argillaceous ores, and the furnace manager judges by the appearance of the glass slag, whether his furnace is working as he wishes, in order to produce the description and quality of iron he wants to make, and he accordingly applies more or less lime, by which he ensures the conversion of more or less of the ore into carburet of iron, and consequently the silica and the other impurities into glass, and such glass protects the metallic iron from the prejudicial effects of the blast. Now, on an examination or analysis of the rich ores or hœmatites, they will be found to possess a very small proportion of silica or materials for glass-making, consequently unless the requisite quantity of glass for protecting the metallic-iron when separated be obtained from some other source than itself, hœmatites cannot be employed in large quantities, even when mixed with poor argillaceous ores, because those poor ores cannot be advantageously worked if the glass slag produced therefrom be proportionably much reduced from that which now results from the present working, which would be the case, if large quantities of hœmatites were to be used with a given quantity of argillaceous ores.

"My invention consists in employing glass, or materials for glass-making, in proportion to the hœmatites used in a blast-furnace, by which means such rich ores may be reduced with facility and advantage, and the cast-iron or carburet of iron protected by the requisite quantity of glass, and the glass slag obtained in the process may be used over and over again. And I would remark that I do not confine myself to the employment of any particular description of glass or materials for glass-making, in carrying out this my invention, as the same may be varied according to the materials which can be most advantageously obtained in the vicinity of the particular iron-works, where my invention is to be employed: thus nearly pure sand-stone with lime are the materials I have employed, because such sand-stone and lime can conveniently be obtained by me near the works where I have matured my invention, but other materials may be used, such as the slag of glass works, and the glass or slag from the blast-furnaces of iron-works, obtaining such slag or glass as free from sulphur as possible. And I particularly mention these matters, because they have heretofore been treated as refuse matters in the works, and may therefore be had at small cost in comparison with other known materials for glass making."

Having thus stated the nature and object

of his invention, the patentee proceeds to describe the means of making cast-iron (carburet of iron) from hœmatites or such like ores, by means of blast-furnaces, as pursued by himself: and he remarks that the ores which he worked with, are those of Cumberland and Ulverston, which are very rich, and on analysis contain in one hundred parts of ore about 67·2 of iron, 28·8 of oxygen, and only about 4·0 silica,—consequently there would be very little glass slag produced by such a quantity of silica, when brought into combination with lime, or other proper material for making glass slag. And it should be stated, that in using more or less rich hœmatite ores, allowance must be made for the quantity of silica and other impurities in the ores, and such is the case in respect to combining the use of hœmatite ores with argillaceous ores, in larger proportions than can now be done, when dependent on the glass slag which will be produced from the silica and other impurities contained in the ores, but such allowance will readily be made in practice, after a little experience, the object being to employ such a quantity of lime or flux, as will convert the whole of the silica into glass, and carry off other impurities, in order to prevent a silicate of iron being formed. In describing the process as pursued by me, I will suppose that the furnace used is an ordinary blast furnace, (and I prefer to employ hot-blast). The glass mixture I have employed for smelting the very rich ores above alluded to is that of ninety-three parts of silica to one hundred and one parts of lime; but I prefer to employ these fused into glass, to using the glass-mixture in the blast-furnace. According to the quality of cast-iron I desire to make, I use more or less of the glass or slag, and I prefer in all cases to use the glass or slag to employing the matters for glass-making separately, before converted into glass; but, as before stated, the glass-slag being once produced from this mixture, it may be used over and over again, the workman judging by the appearance of the slag, and applying lime as heretofore. In charging the furnace I first throw in the coke, or coal, or anthracite, as usual, and then the glass or slag materials for glass-making is thrown in; then again the coke, and then the hœmatites or such like ores, broken small to about the size of hens' eggs, then more coke, &c., in this process for a given yield of iron to that employed in reducing argillaceous ores. In charging the furnace wholly with hœmatites and with glass slag, I use about one part by weight of hœmatites to two parts by weight of glass slag, and if there be much silica in the hœmatites, I mix therewith some lime sufficient to convert the silex into glass, and carry off the other impurities. And it will be evident that as the hœmatites contain more silica, and will consequently produce more glass from itself, the glass slag supplied into the furnace is to be reduced in proportion: the furnace in other respects is to be worked as heretofore practised.

The patentee says, in conclusion, — "Having thus described the nature of my invention, and the manner of performing the same, I would have it understood that what I claim is the mode herein described, of applying glass, or the materials of glass making, with hœmatites, or such like rich iron ores, in the manufacture of iron, so as to make such ores applicable to the making of iron in a blast furnace in a manner not hitherto practised."

ARTIFICIAL PREPARATION OF SUGAR.

1. Sugar similar to that of grapes may be prepared by boiling one part of the starch of potatoes or flour, with from 1-100 to 1-10 of sulphuric acid, and four parts of water, for 36 or 40 hours, care being taken to renew the water as it evaporates. At a higher pressure and temperature, the change may be effected more rapidly with a smaller quantity of acid. The excess of acid is then to be saturated with lime, the sulphate of lime separated, and the liquid concentrated by evaporation.

2. The starch of flour soon loses its gelatinous consistence, when moistened with an extract of sprouted barley; it is transformed into a liquid, and if the barley is in sufficient quantity it is changed in the course of a few hours into sugar of grapes, provided the temperature be maintained at 158° to 167°. Six parts of barley which has germinated, produce 25 parts of sugar of grapes.

3. Grape sugar may also be prepared from wood sawings; it may also be procured by taking 12 parts of linen rags, or paper cut into small pieces, mixing them intimately and gradually with 17 parts of concentrated sulphuric acid, or with five parts of sulphuric acid, and one part of water; the temperature must be kept moderate. After 24 hours, the mass is to be dissolved in a quantity of water, and boiled for ten hours; it is then to be neutralized with chalk, filtered and evaporated to the consistence of syrup, and crystallized.

Chemists have not yet been able to obtain sugar prepared by these artificial methods in regular crystals like cane sugar, although there is little doubt that these two species differ from each other merely in the quantity of water with which they are combined.

NEW PROCESS FOR MAKING SULPHURIC ACID.*

BY M. PROVOSTAYE.

This chemist has proposed the following process:—He recommends introducing into the leaden chamber, sulphuric acid, and the vapor of water. To understand what takes place under these circumstances, a current of sulphurous acid may be passed into a flask containing nitric acid: this should be made, by means of a bent tube, to communicate successively with a flask containing sulphuric acid, a globular vessel moistened with water, and a dry globe. The nitric acid is completely decomposed. The first flask contains pure sulphuric acid alone. Red vapors pass from the first vessel into the second; this is filled with sulphurous acid also, for it is formed of solid white crystals, in the two last experiments as in the first. In the latter, all the sulphuric acid of the second flask exists in a solid crystallized mass, of a greenish yellow color. There actions are, therefore, similar to those of the old process. In the new process, the nitric acid yields a portion of its oxygen to the sulphurous acid, in order to convert it into sulphuric acid. Hyponitric acid is thus formed, which acts like the hyponitric acid in the old process, which is formed from the binoxide of azote and oxygen of the atmosphere: that is to say, successively it yields oxygen to the sulphurous acid, and borrows it from the air; but the discharge requires the intervention of sulphuric acid and water. The water has two very distinct functions: it acts directly, by bringing into more intimate contact the sulphurous acid and hyponitric acid, and this favors the oxidation of the first by the oxygen of the second; it acts also by decomposing the white crystals immediately, and changing them into sulphuric acid and oxide of azote.

NITRATE OF SODA AS MANURE.†

This has been advantageously applied to produce a most luxuriant and abundant aftermath. It was applied after the hay crop was gathered, in quantity about as much as if you were sowing oats; in ten days, a large green mass of vegetation had sprung up four inches high, producing a far greater mass of vegetation than the same field produced in the spring of the year, although the meadow had received a good coating of stalk dung and soil. The application of the nitrate of soda now spoken of, took place in the recent hot weather, and never had a shower of rain upon it during the ten days —every morning there appeared to be a heavy dew upon this part of the meadow, when on the other parts none was apparent. The appearance of this part of the land has a great contrast with the other aftermath, the grass of which is universally low, wiry, and spindling. It might be concluded, had the hay harvest been earlier, a second crop might have been obtained better than the first; it is certain that this aftermath is far superior to the first crop. The grass ominously called squitch grass, is scarcely apparent it; whilst in the rib grass and other herbaceous grasses are most abundant, and very luxuriant.

As nitrate of soda is very apt to absorb moisture from the atmosphere, agriculturists would do well, in purchasing it, to see that they have it well dried, otherwise they would pay a large proportion for water; it should be purchased by a broker from the importer, of a certain refraction, as great gain will be thus insured in obtaining the article.

There can be no question, that in producing hay crops, it would prove the most advantageous manure that can be applied; and without impoverishing the ground, two crops of hay may be annually obtained. This experiment was made upon a very ordinary meadow, and upon the worst part of it; under all the plans of cultivation to which the meadow has been subjected, none has ever succeeded so well, either in quantity or quality of the grass. The experiment may be easily tried at the present time of the year, by any agriculturist—any grass-plot gives an opportunity for the like purpose.

From examples so simply tried, proof sufficient may be made to cause the nitrate of soda to become universally used, for the purpose of a cheap and highly productive manure.

NEW MODE OF PREPARING LEATHER.

We have been favoured by Mr. Grundy, of St. Martin's-lane, with a sample of leather, prepared, as we are informed, by an entirely new chemical process, by which it is rendered very soft and much more pliable than leather prepared by the old process, and calculated, in our opinion, to be far more durable.

MODE OF PRESERVING ANIMALS.‡

M. Salomon directs, for this purpose, that reptiles especially be immersed for two months in strong alcohol, and then placed in a stove, heated to 104°, until they are completely dried.

After this preparation, they may be kept for any length of time without exhaling any disagreeable odour.

* *Inventor's Advocate*, Sept. 5. † Ibid

‡ From *The Athenæum*, August 29.

III. PHARMACY, &c.

MEDICAL REFORM, EDUCATIONAL AND PRACTICAL.

BY CHARLES WATT.

GLADLY indeed would we hail the introduction of any measure of reform having for its object the advancement of the General Practitioner in knowledge, usefulness, and public estimation; every aid we could command should unceasingly be devoted to ensuring the success of those engaged upon so laudable a work. But when we see that, instead of looking to themselves for correction—instead of using all their influence to establish a better system of teaching the different branches of the sciences connected with medicine, thereby ensuring a more perfect education, and enforcing a more rigid examination into their acquirements and qualification—they truckle to the legislature to elevate them by enactments, and to grant them an unwarrantable power of still farther encroaching on the other ranks of practitioners,—we feel called upon to make some remarks in justice to the latter.

So long as the profession is not consolidated into one, as it is in the lower rank, namely, the surgeon-apothecary, the two branches which now exclusively exercise the functions either of Medicine or Surgery must of necessity hold the higher station in society, and, however odious the name of "apothecary" may be to those, *qui gaudent nomine*, they will ever have to bear it and its concomitant degradation.

To each class—Physician, Surgeon, and Apothecary, custom has assigned their relative rank, and this can never be changed by legislative interference, unless the two higher ones are degraded in order to abolish the distinction.

Medicine is a profession concerning which every one clings to his own particular prejudices, deeming himself competent to judge of the fittest person to attend him: to real qualification he pays very little attention. Hence we can readily account for the reason why mere shop-boys having been crammed so as just to enable them barely to articulate a quantum of medical "hotch-potch" at Asafetida Hall, may then exercise with impunity their dignified calling with mystified bombast and disguised ignorance, thus unworthily assuming the duties and encroaching upon the rights of the Physician, the Surgeon, and the Chemist, combining at the same time the incongruous mixture of "PROFESSIONAL GENTLEMAN," and "TRADESMAN," while, in truth, their education unfits them for either.

It will not be astonishing to our readers, when they reflect on the origin and education, both classical and professional,* of such a person, that, for the sake of acquiring wealth, he should use those little arts (so totally repugnant to the man of science and gentlemanly demeanour) by which he may win the kind favors of the fairer part of creation, from the infant to the old maid or dowager. He is to be found at chapel with the serious, and at "an innocent game of cards" with the more free; he is "all things to all men," aye, and women too;—the intermeddler in every family affair—the depository of every secret. This little creature subserves the purposes of the familiar friend, carrying from house to house all the scandal and gossip suited to his taste and small capacity, until he has conveyed from one to another, throughout the whole precincts of his abode, the affairs of every one of his patients as "most profound secrets," and has so fixed himself in the confidence of each, that it is next to impossible to get rid of

> "This flimsy thing, whose only use is
> To retail scandal and abuses,
> Who knows of physic just as much
> As mother Eve did of High Dutch."†

With such a thing as this at one end of the profession, and a Harvey, a Hunter, an Abernethy, or a Lawrence at the other, little is to be hoped for, except from education: legal enactments never can raise the one, nor can they level the other, to a common rank.

Yet is it this very man who is crying out for medical reform as regards *payment*, and the privileges of Chemists. That he is the party who most needs reform we very readily admit; and if he begins at home he will have too much to employ him to be able to think of others, he will no longer have to cast reflections on Chemists, and will cease to appeal to that popular organ of his peculiar class, *The Lancet*, to uphold his dignity, and denounce, as "IGNORANT chemists and pretenders," those who, when asked, venture to prescribe to their customers such *simple* remedy as may be suited to any trifling ailment, even though it may be to prevent error.

Taking the general run of Apothecaries, they are *indeed finely* qualified to sit in judgment on others! the greater part of them are sad

* It is difficult to say which he most lacks.

† Old Medical Poem.

compounds of ignorance, conceit, and arrogance, and this is not better illustrated than in the circumstance of such eternal occurrence as the publication of cases. An insulated case, forming a perfect anomaly, and a total exception to every rule, and from which no inference can be drawn on which to found any general line of practice, is noted with the greatest gravity, and, after some six months' parturition, is delivered into *The Lancet*. Thus we have Mr. Shaw's case, Dr. Davis's case, Mr. North's case, &c., &c., &c. It may be, some girl is fool enough to get a pin into her ear, and there it remains for six months, when at last—of course, after *great trouble*—the attendant gets the head, and then, after two or three days, he gets the tail, as in this little instrument there is nothing else to take.

The patient takes a draught, prescribed in Latin, which would make the village pedagogue blush. She is reported, consequently, to have done this, that, or the other, rightly. Takes something else—is not so well to-night is seen again (unless she is an HOSPITAL OF POOR-LAW patient, and if so, has had some such important mishap as a *sacro-ischiatic rupture*), takes some other nostrum, and, like the termination of a novel, or rather a farce, the result is favorable, the fame of the practitioner is stamped, and all the ladies, particularly the old ones, who are his patients, look with astonishment at the skill of their adviser, and bless their own good luck in making such a choice.

We are very far from setting any very high value on the powers of the medical profession generally; on the contrary, we are of opinion, and we utter it with inexpressible sorrow, but with the deepest conviction of its humiliating truth,—that if the whole profession were suspended for three years, the bills of mortality would be considerably decreased! for with the small exception of operations in surgery, and obstetrical assistance, the sad ignorance which prevails in the more abstruse departments of medicine, and the meddling officiousness of those who pay themselves by drenching their victims, are the causes of incalculable injury to, and the destruction of, those organs on which their baneful nostrums operate!

We next proceed to inquire what is the kind of reform these gentlemen are seeking at the hands of the legislature. This is easily stated. Their chief objects are to obtain legal right to take fees, and to prevent chemists from prescribing. Now, it is quite clear that if they are permitted to charge for time and attendance, by fees, that they ought not to take the chemists' rights also, and be suffered to charge for medicine at the same rate as they now exact, neither ought they to have the privilege of making up prescriptions. We would ask them why they should expect to have the right of exercising the four branches of the profession, namely, medicine, surgery, midwifery, and pharmacy, and to exclude chemists wholly from every one of these, except the latter? We would also ask, which of the classes is the greater encroacher on the rights of his brethren? The physician sometimes practises midwifery, the surgeon never; but the general practitioner not only practises all these, except operations in which no one will trust him, but he is a chemist also, dispensing prescriptions and selling by retail.

We would here observe, that with regard to the apothecary, there is no sufficient guarantee to the public as to his acquirements; whereas, with respect to the physician and surgeon, there is the college education of the one, and the engagement at public institutions of the other. We advise the Members of the College of Surgeons to put M.R.C.S. after their names, on their doors and cards.

Little, indeed, can these gentlemen boast of their exertions to advance medical science. Until within the last forty years, the grossest ignorance prevailed in their prescriptions and mode of compounding chemical substances. It is really melancholy to reflect on the sad fact, that while the immortal Hunter was enlightening the dark paths of physiological and pathological science with his discoveries, it is within the memory of the writer that this branch of the profession still retained in their shops the articles of "the powder of crabs' eyes," the "powder of dead mens' skulls," and "album græcum."

We trust we have said enough to convince every one that this class of practitioners has nothing to expect from legislative aid.

We would advise chemists to acquire more knowledge, and to watch any measure brought into parliament, in order to prevent the passing of any bill prohibiting them from practice. For this purpose an Association, to which we beg to solicit the assistance of our readers, is being formed to take proper means, and to raise a fund to meet any contingencies required for the maintenance of the rights of chemists and druggists. We see no reason why there should not be a chemist-apothecary as well as surgeon-apothecary.

Our own opinion concerning the division of the medical profession is, that if the middle rank is allowed to practise the several departments of medicine, surgery and midwifery, chemists should be allowed, of course if qualified, to practise pharmacy, to visit out-door patients, and to dispense prescriptions. We are quite certain that when

required, the qualifications of these gentlemen will equal, if not excel, those of the former.

That there are far fewer mistakes, and that these are even less serious, committed by chemists, than by the apothecaries, we are convinced. It is only very lately that one of the latter class, getting up to serve an ounce of tincture of rhubarb, gave the same quantity of tincture of opium in mistake, and the woman who took it, and who, fortunately under proper treatment at the hospital, recovered, is yet so ill as to leave no hope of her lasting the ordinary time.

We have lately seen a prescription of a surgeon in good practice, near St. Paul's, which is composed of compound spirits of ammonia and elixir of vitriol.

We would advise our brethren, the chemists, to receive instruction in medicine, pharmacy, and chemistry, if they do not wish to attend to anatomy,—this will give them a sufficient knowledge to protect them against the imputation of ignorance, and from being held up as objects of caution by the general practitioners and *The Lancet*.

Let us now take a view of the education and acquirements of the greater part of "general practitioners," and their mode of obtaining them. In classical acquirements, with very few exceptions, there is not one who could translate the first line in Eutropius, or repeat the first page of the Eton Latin Grammar; Greek is to them "a sealed book." If they can manage to get by rote a few pages of Celsus, which, from its subject being so closely connected with medicine, it is easy to remember, after a few drillings with a translation, they are quite satisfied of possessing a sufficient stock of Latin.

Their introduction to the study of their profession is through the medium of apprenticeship, a barbarous relic of bygone times, when the sciences were linked with the haberdashers and saddlers of Guildhall, and taught by the freemen of the civic companies under the appropriate appellation of "arts and mysteries,"—terms which seem to indicate their connection with occult science and alchemy.*

Under the guidance of such parties as those to whom they serve their time of five or more years' slavery, what kind of instruction do they generally obtain? In most cases they are employed more in the capacities of domestics than in that of pupils in science. (This is the case more especially in the country.) When the time has expired, they are found to have learned the art of dispensing medicine, and to have seen a few cases of which latter they know as much of the history and indications of cure as of algebra.†

The next step is to walk the hospitals, as it is termed, and the term is not inappropriate; for the students may be seen walking up and down at all hours, looking at the women, and in the neighbourhood of each place that should be especially dedicated to the acquisition of science, they are marked as a thorough nuisance: it is with regret that we announce the incontrovertible truth, that the general conduct of medical students is more disgraceful than that of any other class of persons who are destined for the study of that kind of knowledge which constitutes the profession of gentlemen. Earnestly do we call the attention of the professors to this disgraceful fact, and exhort the pupils to such deportment as shall in future repudiate such a stigma.

The system of education which during the present session we shall establish, will at once put a stop to all such conduct, and enhance the respectability of the profession. We here give a brief exposition of it:—

The first portion of the method is, to divide each subject into classes (taking, for example, Anatomy, as it is given in the sequel), and again to subdivide these classes as minutely as possible.

The next step is, to have a set of printed charts or cards containing just as much matter as can well and easily be acquired each day; allowing, at the same time, for the other studies which belong to professional education; the amount of matter on each day's chart being regulated by the whole number required for the course of anatomy. This chart being learnt by the time at which the class meets again, the pupils will be required individually to repeat to the examiner appointed, and to demonstrate all the parts and circumstances connected with each particular point, on the bone or recent subject, the dry or moist preparation, as the case may be. If the pupil thoroughly know it, he delivers up his chart, and receives another; if not, he keeps it another day; and if his deficiencies are but few, he may receive another, but never more than two.

The office of daily examination is to be deputed to the pupils in turn: so that each

* They have ceased to be any longer the disciples of alchemy; but from the occult sciences they have by no means separated, so far as their advancement in medical science is concerned.

† We are aware that many medical students go to the hospitals once a week to put down their names for the past week, in the book kept for the purpose of seeing who does and who does not attend. One student who was in the habit of doing so was accosted by the lecturer, whom he did not know personally, and was thus detected.

is made to demonstrate. Thus, while he is himself learning, he is made to assist others less advanced; and by this means is maintained a regular system of reciprocal teaching and learning.

At each daily course of instruction, however, the professor is to be present; and, on his daily inspection, he will have a perfect knowledge of the proficiency or inattention of every pupil committed to his care, and will thus be enabled to encourage the one, and correct the other.

The business of the daily examiner is to put the word "Absent" against the name of such pupils as do not attend; to see that none of the daily charts are undelivered; and to enter all that are not delivered at the daily attendance. The examiner is also to record in a book the progress of each pupil; and, if he have made no more than two omissions, to state these, in order next day to see if they are then known to the pupil.

At the time of delivering the charts or cards, the person who is entrusted with this office is, if the subject be anatomical, to demonstrate all that each card contains, on the natural parts. If it be a subject of chemistry, he is to illustrate the facts by experiments, and to explain all relating to them. In the medical and surgical departments, it will be the duty of the teacher, on each succeeding day, to deliver to the pupils of each class, the history and treatment of the accidents which befal those parts, and the diseases which affect those functions, the knowledge of which they have previously acquired. This is all the lecturing admissible into this system of teaching.

When the pupils of any class have acquired the knowledge which is its object (of the bones for instance), they enter another class (that whose object is the ligaments), and so pass on, until they complete the whole of the classes in the course of instruction; at which period they receive from the professor a certificate of attention and proficiency, in order to entitle them to appear before the public examiner, whose duty it is to act between the candidate and the public, as the judge of the one, and the conservator of the interests of the other.

On the Saturday of each week it will be the duty of the demonstrator of the day, assisted by others (for as already said, one will be appointed for each day), to make recapitulatory examinations of the pupils, as to their knowledge of the week's business, to render up to the professors an account of each pupil's progress, as recorded in the book which is kept for such purpose, and which contains an account of the mistakes made by each pupil in his examinations. If they exceed more than two or three in each day, or by their frequent recurrence evince a want of due attention and perseverance, the pupil must either employ additional time to keep pace with the class, or he must suffer degradation.

To such a method of teaching none will hesitate to submit, except those who, under the present one, would avail themselves to the utmost of the opportunity it affords for inattention and idleness. It is, therefore, for these especially, that such a check is requisite. By the assiduous and steady pupil, it will be hailed as a boon; while the careless one, on the contrary, will be made to feel that he cannot trifle or neglect with impunity, or without detection and remonstrance.

Those medical students who come from distant parts of the country, seem to imagine, that to get rid of their plough-tail rusticity, they have only to get the assistance of a London tailor, to be at once mistaken for the refined gentleman,—that they have only to imitate every imperial-chinned, moustachio-muzzled puppy, not only in fuming segars and in drinking, but in the highest metropolitan refinement of the most degrading profligacy and beastly licentiousness, following him into all his dens of folly and vice.

We earnestly repeat our exhortation to them to get a far more competent knowledge of medical science, and to look to their own individual attainments for honors and advancement; and, while they are importuning parliament for acts to secure their mode of gain, to bear in mind the advice of Solomon, "with all thy getting, get UNDERSTANDING."

MEMOIR ON THE MEANS TO BE ADOPTED FOR DETECTING CUPREOUS PREPARATIONS CONTAINED IN THE HUMAN BODY AFTER POISONING, AND OF DISTINGUISHING THEM FROM THE COPPER NATURALLY EXISTING IN MAN.

BY M. ORFILA.

Our readers are aware that in former Memoirs (for which see "The Chemist," No. I., 2d edition, p. 15, and No. V., p. 153), M. Orfila endeavoured to prove that the soluble preparations of arsenic and antimony introduced, during life, into the stomach, the rectum and the cellular tissue of man and the dog, were absorbed, and that it was to this absorption that the poisoning was attributable. It remained for chemistry to seek, in the organs situated at a distance from the part where the poison had been deposited, the material demonstration of this absorption—the poisonous substance

itself; this difficult task has happily been accomplished, and tartar emetic deposited in the stomach has been detected in the blood, the vital organs, and the urine. M. Orfila analysed the urine of some patients to whom MM. Dumeril and Bouvier had administered large doses of emetic, and he proved the presence of antimony in that liquid. A woman to whom M. Bouvier had given five centigrammes of emetic, and who died fifteen hours afterwards, without vomiting, had antimony in her liver and spleen.

It is the same with soluble cupreous preparations, as with arsenical and antimonial ones; they are absorbed, when taken into the stomach, into the rectum and into the cellular tissue, during life: from very recent chemical investigations, showing that the human tissues in the normal state contain a certain quantity of copper absorbed during life, (see *The Chemist*, No. VIII, p. 251), which naturally exist in the tissues, it would be impossible to decide on a medico-legal report announcing the presence of that metal in the body of a poisoned man: M. Orfila thinks he has found the means of overcoming this difficulty. Moreover, the living tissues are after death subject to the laws of imbibition. It might, therefore, happen that, by a refinement of villany, a malefactor might deposit a cupreous solution in some part of a man who had died a natural death, in order afterwards to accuse an innocent person of murder, and that, by chemical means, the poison might be detected in the organs to which it might be drawn by imbibition. The object of the three sections of this Memoir is to elucidate these three very serious questions, for they particularly relate to the honour and lives of men.

I. The soluble salts of copper, deposited in the stomach, rectum, and cellular tissue are absorbed during life. Before coming at the proof of this proposition, M. Orfila wished to ascertain the best process by which the cupreous salts, mixed with organic substances, might be discovered. We may say that the following is the result of numerous and very various experiments, which alone, in such a matter, can give weight to assertions.

1st. Of all organic matters, albumen forms with the acetate and the sulphate of copper, the most insoluble compound: however, prolonged boiling in a large quantity of water removes from this mixture a small quantity of cupreous salt.

2nd. Long boiling in water separates the cupreous solutions from the food with which they are mixed:

3rd and 4th. As the organic matters present an obstacle to the precipitation of the copper on a sheet of iron, before this precipitation can be effected, they must be destroyed:

5th. The sheet of iron is as sensible a test as prussiate of iron for detecting the least traces of copper, provided that one has the patience to wait an hour for the effect, and provided that the solution acted on be very concentrated. A sixteenth of a drop of a cupreous solution may be detected in a gramme of water:

6th. The incineration of the animal matters containing traces of copper, with nitrate of potassa, permits the smallest proportion of that metal to be discovered.

In order to prove that copper is absorbed, many dogs have been poisoned; some have been killed and others left to the virulent effects of the poison. By subjecting to a prolonged boiling, the liver, spleen, kidneys, lungs and heart of these animals, portions of copper were found in all these organs; in some death was owing only to the poison, and the organs were not submitted to experiment until long after death; in others, almost immediately after. Some were killed soon after being poisoned, and their organs were subjected to analysis: the results were the same. M. Orfila concludes:—1st, That in dogs poisoned with sulphate or acetate of copper introduced into the stomach, copper is found in the liver, spleen, heart, kidneys and lungs, on those organs being submitted to a long boiling in water: 2nd, That the same results are also probable with man.

II.—This section is intended to prove that the copper obtained by the preceding preparation, namely, by long boiling of the organs, is not that naturally existing: the presence of copper in the living tissues of man and the dog, is actually a fact incontrovertibly proved. Vauquelin was the first who made mention of the presence of copper in incinerated blood; but, as he operated in a copper vessel, the presence of that metal in the ashes of the blood was attributed to that circumstance. Gahn had already announced the presence of copper in vegetable and animal tissues, when M. Bouchardat in 1837, and M. Duvergie in 1838, again supported these experiments with their authority. In order to distinguish natural copper, if it may be so called, from copper which has caused poisoning, M. Orfila availed himself of the following experiment: he submitted the organs of man and the dog, for six hours, to boiling in water, incinerated these organs with nitric acid, then treated the residue with water, and never detected an atom of copper. Now, we have seen that in poisoned dogs, the organs, treated in the same manner, always gave evident traces of copper: normal copper, on the contrary, is obtained by incinerating the carbon of the organs.

Boiling water does not dissolve half the copper furnished by poisoning to the or-

gans; for, when this first quantity has been removed by the water, incineration gives more considerable quantities of copper than there would have been without poisoning.

III.—It may be believed that the copper found in the organs of poisoned animals might be brought there from one to another, by imbibition, as some physiologists assert, during life, and as is incontestable after death.

Imbibition during life is demonstrated by the following experiment:—

Completely isolate a vessel,—a large vein is preferable,—and tie it above and below by two ligatures for a certain portion of its length: then rub it with a soluble poisonous substance. The animal on which the experiment is tried will be poisoned. Now, here it must be imbibition that carries the poison beyond the isolated portion of the vessel. This point once freed, the poison is immediately absorbed. Science is indebted to MM. Magendie and Fodéré for these facts. In the living body, imbibition is rapid; in the corpse, no one can deny it, it has not the same rapidity. If persulphate of iron be injected by the œsophagus into the stomach of a dead subject, and if, some time afterwards, the external surface of that viscus be touched with a solution of prussiate of potassa, the color renders the imbibition manifest. In his investigations, M. Orfila set about ascertaining the rapidity of *post mortem* imbibition. 38 grammes of sulphate of copper, dissolved in 120 of water, were injected into the stomach of a corpse, the body was opened eight days after; the temperature had been maintained at from 8° to 20° C.—all the stomach was blue, the surrounding organs were partially so, in those points only which had been in contact with the stomach, whose great culde-sac had imbibed most; the salt had perfectly traversed the liver, and had arrived at the base of the right lung, which also was bluish or greenish; all the points whose color was changed and produced by the cupreous solution, gave by boiling water, a great quantity of copper: all the portions of organs whose color was normal, and which had not imbibed anything, gave no copper by the same process. Thus, every portion of the subject put in contact with a soluble cupreous preparation takes a bluish or greenish tint, which denotes the presence of copper. The tissues near the point where the salt has been deposited may imbibe some of it; but they are colored and contain it in those places only.

A hand and an arm, covered with skin, steeped for ten days in a concentrated solution of copper, did not present, at the internal surface of the skin, any trace of copper, even when the epidermis was removed; the skin itself contained in its interior traces of that metal. This experiment shows that the skin is a great obstacle to imbibition, and supposing a subject was deposited in a very cupreous soil, a long time and a great quantity of the salts would be required that the copper might be transported into the centre of the organs, if the corpse were not that of a poisoned person.

GENERAL CONCLUSIONS.

From the preceding experiments and considerations, it results:—

1st. That acetate and sulphate of copper, introduced into the stomach or applied to the sub-cutaneous cellular tissue of living dogs, are absorbed and carried into all the organs of the animal economy.

2nd. That, probably, it is the same with man.

3rd. That it is possible, by aid of certain chemical processes, to extract metallic copper from that portion of these salts which has been absorbed.

4th. That it becomes indispensable to recur to this extraction when these poisons have not been found in the digestive canal, or in the other parts to which they have been immediately applied, or in the vomited matters; for by limiting, as has hitherto been done, the search for cupreous salts in the matters proceeding from the stomach and intestines, there is a risk of not discovering them, either because they no longer remain in the digestive tube, or because the vomited matters have been withdrawn, whilst the metal may always be obtained from the absorbed portion.

5th. That a Medico-legal report should be declared INCOMPLETE and INSUFFICIENT from the fact *that is the case indicated*, the search for cupreous salts in the parts where they exist after having been absorbed shall have been omitted.

6th. That independent of the cupreous salts absorbed during life, and which are found unequally disseminated in *all the tissues*, many of our organs, and especially the abdominal viscera, if the salts have been introduced into the digestive canal, also contain, especially at that part of their surface which was in contact with that canal, the portion of those salts which has come to them by *post mortem* imbibition, and whose quantity varies according to the period at which the bodies were opened; that, from that time, the copper procured as the last result from these organs, arises at once both from the salt which had been absorbed, and from that which had traversed the tissues after death.

7th. That the imbibition in question, put beyond doubt by the experiments of Fodéré, Collard, Martigny, Magendie, &c., and by M. Orfila, is a phenomenon which does not exclusively belong to poisoning by

copper. since it has been observed *in all poisonings* in which the poisonous substance, incompletely absorbed during life, after death remains in our tissues, provided that this substance be in solution or susceptible of being dissolved in the liquid with which it is in contact; thus that which has just been said relative to the proportion of cupreous poison furnished by the viscera, either through absorption or imbibition, is applicable to all those kinds of poisoning in which the poisons have been absorbed.

8th, That it is possible, in most cases, to determine whether the salts of copper and other poisons procured from the viscera, in medico-legal investigations, were administered *during life* or *after death*, either in respect to the symptoms previous to death and the lesions of the tissue, which have been proved at the opening of the bodies, or by aid of chemical experiments tried on such an organ situated at a distance from the digestive canal rather than on one near to it, or on such a part of the same viscera in preference to such another; that, indeed, in some very rare cases, as after a long inhumation, and when there remains nothing but the *detritus* of the viscera, the problem in question might be less easily resolved, if the information collected by the magistrates did not tend to enlighten the operator by *positively* establishing that the poison had not been introduced into the digestive canal after death. However, judicial annals do not present any instance of malice being carried so far as injecting a poisonous substance into the digestive canal of a corpse.

9th. That the cupreous salts which have caused poisoning may be detected, by boiling, for an hour, with distilled water, the various viscera and the flesh, drying the filtered decoction, and carbonising it by nitric acid, or by decomposing it with nitrate of potassa.

10th. That even at the expiration of six hours, by the aid of boiling water, the whole of the absorbed cupreous salt is not dissolved, but that sufficient to put its existence beyond doubt may be extracted.

11th. That distilled water, after an hour's boiling, did not dissolve a single trace of the *normal copper* contained in our tissues; that it can only be partially separated by the concentrated acids, and wholly, by incineration, so that a jury should conclude that a cupreous preparation has really been taken during life, either as a poison or as a medicine, if copper be obtained from an aqueous decoction by boiling for an hour, with distilled water, the viscera or muscles of an individual suspected to have been poisoned, unless it be proved only that this cupreous preparation arrived in the organs in consequence of a *post mortem* imbibition.

12th. That it is preferable at first to subject to aqueous boiling the viscera of the digestive canal, than the portions of the abdominal organ which have not been touched by this canal, and afterwards to act on the portions which have been in contact with the stomach and intestines: by operating thus there is a certainty of constantly obtaining a greater quantity of poison from these last, and of collecting information calculated to facilitate the solution of the questions which it may be tried to raise as to imbibition.

13th. That if medico-legal investigations, instead of being extended to the organs, were limited to the alimentary or excrementitious matters contained in the digestive canal or the vomited liquids, these matters should be boiled for an hour, with distilled water; the liquor must be filtered and dried, and then decomposed by nitric acid, or by nitrate of potassa, very free from copper; the presence of that metal in the product thus formed permits it to be affirmed that a cupreous preparation has been taken as a poison, or as a medicine, — at least that it has not been injected after death into the digestive canal. Although the cupreous salts intimately combined with organic matters only very partially dissolve in boiling water, the solution, as we have already said, contains sufficient metal for a sheet of iron to extract it.

14th. That if, after having treated these alimentary or excrementitious matters by boiling water, no copper had been found, it would be wrong to subject them to the action of the strong acids, or to incineration, in the hope of discovering copper which had poisoned, because, even supposing that it be obtained, it could not be concluded that it arose from a cupreous salt having been ingested as a poison or as a medicine, whilst many substances contain normal copper capable of being detected by incineration. It is therefore better not to look for copper in these alimentary matters, but to submit to the action of boiling water, the digestive canal, the liver, the spleen, the kidneys, &c., as we have already said.

15th. That, quite admitting with M. Devergie that the quantity of normal copper contained in the intestines of a grown up man or woman does not exceed 46 milligrammes, I cannot admit with him that it is important to take this proportion into consideration in order to decide, by aid of incineration, whether the copper obtained is or is not normal copper, because, as he himself says, the quantities of normal copper found in the few experiments which he made, are too variable for the indicated cypher to be accurate, and especially because it may happen every day that after poisoning by a cupreous salt, so little of it might remain in the intestines, that by add-

ing the weight of the copper thus furnished, that which naturally existed in those viscera, only 40 or 50 milligrammes might be obtained. That we might take into consideration the proportion of copper yielded by incineration, when this proportion far exceeds that which the latest and most numerous experiments indicated as being really the maximum of normal copper; but that, even in this case, it is infinitely preferable to adopt the means which I propose, because it furnishes clear and accurate results. In conclusion, *the* COPPER *of* POISONING *may be partially extracted from the organs which are boiled for an hour in water, whilst* NOT AN ATOM *of* NORMAL COPPER *can be extracted by this process.*

SYSTEM OF QUACKERY AND ITS EVILS.—PROPOSED REMEDY.

To the Editors of the Chemist.

GENTLEMEN,—It grieves me beyond measure to think how far the system of QUACKERY is carried, in these would-be enlightened times. One would suppose the improved system of education to be somewhat of a guarantee that the people would possess sufficient *common sense*, to enable them to close their eyes upon the gross absurdities which come daily before them. But the REVERSE is the case. Nor do I think the medical practitioner or the chemist to be the least injured by the glaring and incongruous advertisements which so continually throng our newspapers. Nay, it not unfrequently happens, that the very individual from whom emanates some famous panacea, sets up his claim as belonging to that profession which he is attempting to undermine. For what need would we have for doctors, did their combination fulfil the many wonders recorded of them? That any new "*patent*," brought out with enough of effrontery, takes, is self evident from the numbers which start up around us, productive of some notoriety and an extensive sale, until the novelty is past, and then the miraculous "wonder working" compound sinks into oblivion, and is laid upon the shelf, until again brought forward with some new title, a more gorgeous exterior, and the addition of some extraordinary cures.

We have had some ludicrous occurrences in this particular way—annoying, I mean, when detached from moral feeling. A man brings out a new remedy, takes a house, vends his medicines, obtains a trade, makes some money, falls behind in his payments, pleads poverty, and—dies. But behold him, in another street of your great city, under a different name, but having a fine house, and *not* the same human being, who, a few weeks ago, was a miserable abject bankrupt, whose constitution was so shattered by misfortune, that he perished from—a broken heart. This then is what I would term the aristocracy of quackery,—and may mention, that this particular instance is neither overdrawn nor fictitious, as I have reason to know it *practically*. But this high walk requires much ingenuity in the performance.

Let us only cast our eyes over the newspapers, and we shall certainly meet with something combining in itself all the virtues possessed by the different articles included under our list of Materia Medica. Here we have the express declaration of a *medical man*, recommending some deleterious compound to whiten the teeth by destroying the enamel—nature's protector,—"that it is both *absurd* and *dangerous* to brush the teeth;" and there we have an intimation that "life may be prolonged and youth renewed." The former, to judge from his statement, would eschew ablution in any form, and condemn the removal of *filth* as *obnoxious* and *dangerous*; while the latter has no doubt discovered, what our fathers so eagerly sought after, the "Elixir Vitæ." It needs not that I should enumerate more. I only regret that such glaring and impudent attempts at swindling so frequently succeed. We have instances of men even amassing great wealth by their presumption. Look at the *single R* Morison, who, by introducing a modification, and a wretched bad one, of the Pilul. Cambog. Co., has become celebrated as a powerful magician who cures all diseases by one *simple vegetable agent*. We have also Holloway, an external application (Ung. Hydr. Nit. Mit.?), which, by its invigorating influence, is not only to cure, but prevent cholera and many fevers. Talking of the good effects of his ointment in cancer and yaws, he says, "by rubbing this ointment morning and evening beneath the arm-pits, stomach, and thighs, *cholera* may *be set* at *defiance*.—Measles and small pox are greatly modified by using it in the same way." And yet this is a preparation sold within a few miles of John o' Groats, ranging therefore from the extreme points of our island.

But, gentlemen, how are we to get rid of this evil? I must premise that the *respectable* practitioner and chemist are both injured by quack medicines. When a community is witness to an illiterate person starting up, promulgating, with the greatest boldness, the *discovery* of a remedy said to cure all those diseases to which men, women, and children are subject, and which statement is never once contradicted by educated people, they are apt to treat the regular

medical practitioner with contempt, and set aside his cautious and scientific treatment for that of the empiric. And even when the disease has gained ground, and necessitates them to lay the case before a physician or surgeon, they are ever ready to leave their native or resident place, and wander into some larger town to obtain the advice of some most celebrated man. Now, we might, without presumption, assume the position, that had this case been properly treated from the commencement, much trouble, pain, and inconvenience, might have been saved to all concerned, — the patient better, — and the practitioner and chemist equally benefited and more respected. This system of quackery is an abuse calling loudly for reform,—for thus is the medical profession in all its ramifications kept under,—nay, what better proof need we, than to revert to the time of the Morison mania, during which his pills were administered, either by his agents or by the friends of the patient, before the regular medicaments of the medical gentleman! Even death, caused by inflammation, from the drastic power of gamboge, has scarcely opened the eyes of some people; for, may I ask, is the use of those pills now obsolete? We answer no!! Why then, in face of this infatuation, what can be done? We might say, render it imperative on the newspapers to receive no quack medicine advertisements. This would check the circulation of the medicine to a great extent. But would it not strike at the very root of this evil, to have a legal enactment, by which the claims to utility of any discovery in medicine, might be determined by a committee of medical men, appointed for that purpose, invested with full power to *try practically* the *many virtues* ascribed to particular medicines. I state this simply as a proposition, and forward this (if your space will permit) for insertion in your excellent journal, that so attention might be drawn to a practice which has already reached to a dangerous extent. Before concluding, I would remark how much the nefarious plans of the empiric have been forwarded by the certificates of some of the first in our profession in London. Some of these I know to have been obtained under false colours, but why do the medical faculty not take some public way to make this known? They pass it quietly over, and thus hold out every inducement for such persons to proceed in their evil way; and assuredly the quack allows no chance or opportunity to slip, which has the least prospect of furthering his plans.

I have the honor to remain,
Gentlemen,
Your most obedient Servant,
Edinburgh.—G. S. I. M. R. C.

PATENT MEDICINE LICENCES.

GENTLEMEN—I beg, through the medium of your journal, to call the attention of your readers to a tax, which, in my humble opinion, is very unfair in its operation, as the following will show. 40*s.* is required by the stamp office for a licence to vend patent medicines in the cities of London and Westminster, the borough of Southwark, and the limits of the (late) twopenny post; beyond these limits 5*s.* only, except in cities and boroughs, when 20*s.* and 10*s.* are respectively demanded. Now I, as a country druggist, being resident within the prescribed limit, pay as much for my licence as the largest wholesale house in the trade! and, were I resident only a mile or two further from town, I should have to pay only one-eighth part of the sum I now pay, though I might probably vend many more medicines. Is it to be supposed, gentlemen, that I and others similarly situated in the range of the old twopenny post, can afford or ought to pay as much as the wholesale or largest retail businesses in the Metropolis? It is not justice; it is partial and unfair in its operation; and now that the postage is altered for the public benefit, I trust the scale of the Patent Medicine Licences may also be altered, and that we sufferers may not have so large a portion of our profits on the outlay of the capital so employed, absorbed by the tax in question.

In conclusion, I may add that some time ago I wrote to Mr. Hume, M.P., on the question, and he agreed with me as to the unfairness of the impost, and, moreover, offered to present a petition and support the prayer thereof, in the House of Commons, provided I got it numerously signed. I, however, had no time or means to accomplish that then, and there being no journal peculiar to us, to advocate our grievances, there the matter ended.

I am, Gentlemen,
Yours respectfully,
Sept. 7th, 1840. J. T.

NEW METHOD OF OBTAINING THE MORE POWERFUL VEGETABLE PREPARATIONS.

BY MR. BENTLEY.

We have been favoured by Mr. Bentley of Moorgate, with a pamphlet containing a detailed description of his very judicious mode of obtaining vegetable preparations, which as hitherto prepared are by no means regular in their action, as most of our readers will admit.

Mr. Bentley says he is aware "that some persons consider that the dried powder of the leaves possesses the whole properties

of the plant; and I do not doubt that when the powder is fresh it may do so: but it is essential to bear in mind the fact that light acts as a decomposing agent, and that much precaution is necessary to prevent chemical action dissipating the principle upon which its efficacy depends.

"It has frequently been urged, and with some degree of truth, that vegetables vary according to the season in which they are gathered, and the nature of the soil from which they are procured; but I am not willing to attribute so much to this cause as to the careless, and, at present, defective manipulation.

"In the preparation of Extracts equality of temperature is a point of great importance.

"My observation on this point has been extensive; and I am fully persuaded that a temperature above 120° F. is sufficient to volatilize the principle upon which their efficacy depends.

"It will be my endeavour to show, by a process quite as simple as that at present is employed for obtaining the Extracts and Tinctures, that we may procure a preparation, uniform in strength, certain in its action, and not decomposable by light."

Mr. Bentley gives the following description of his process:—

"The plant being carefully selected from its healthy character and full maturity, the leaves, stem, and, when advisable, the root, are well bruised in a marble mortar, then placed in a powerful wooden press.

"The juice thus collected is allowed to stand, in order that a deposition of fæculent matter may take place, which it usually does, in very large quantities, in the course of twenty-four hours. Alcohol, 56° overproof, is then added in the proportion of four fluid ounces to every sixteen fluid ounces of the juice, which is quite sufficient to render the preservation complete, and throw down any mucilage which may be mechanically suspended.

"After standing for twenty-four hours, the juice filtered through bibulous paper, (that made from wool is the best,) will be found to retain the whole virtues of the plant for any length of time.

"The juices which I have thus prepared, and which have been put to the test of experience, are those of Conium, Digitalis, Belladonna, Hyoscyamus, Taraxacum, and Artemisia Vulgaris."

Mr. Bentley's preparations have been used by many eminent medical men, and with the most complete success. Among those who have given their most unqualified approval to these preparations we may mention Drs. Gregory, Cobb, Kerrison, Fox, Little, Weatherhead and Munk; and Messrs. Kingdon and Pereira: to which we may add our own.

TRIAL OF MADAME LAFFARGE FOR POISONING HER HUSBAND.—CHEMICAL TRIALS.—OPINIONS OF THE CHEMISTS.

We lay before our readers a detail of the chemical trials to which certain portions of M. Laffarge's body were subjected. Our readers will find a great difference between the results obtained by the first chemists and those obtained by M. Orfila and his colleagues—a difference which has been very satisfactorily accounted for by the latter gentlemen.

The commissioners appointed by the court having effected the exhumation of the body, a hideous spectacle presented itself. The body was so much decomposed that, instead of the usual instruments, it was necessary, in order to take from it what was wanted, to use a spoon, which was sent for from the village. This species of paste, rather than flesh, was put into earthen pots, to be brought to Tulle. On their arrival the chemists placed their alembics near the Palais de Justice. Five or six furnaces were ranged in a circle, and supplied with charcoal from an enormous brazier, which was kept constantly at a red heat. The heights which commanded this extraordinary scene were crowded with spectators looking on the operations of this laboratory in the open air, but they were hindered by a dense and fœtid vapour from seeing much of what was going on. The odour emitted was so powerful, that at the afternoon sitting it was thought it would be impossible to remain in court. The ladies, however, sustained the annoyance with astonishing resolution.

After the experiments necessary to enlighten the tribunal had been performed, M. Dupuytren, brother of the late celebrated physician, read the report in the name of the commission of which he formed part. The report commenced by stating that the commission had operated first upon two-thirds of the liver, weighing, when dried, 120 ounces, 60 of which were dissolved in pure nitric acid, which was heated and evaporated until a friable spongy charcoal, weighing 21 grammes, had been obtained, which was pulverised and placed in a glass vessel with 90 grammes of distilled water. This was allowed to macerate for a whole night, and on the following day was put into a small retort and boiled for an hour. The liquid was then filtered, and the result was a brown liquid, to which was added sulphuric acid, with a few drops of hydrochloric acid, which formed a brown precipitate, soluble in ammonia. When acted on by the ammoniacal sulphate of copper, there was a green colour; by neutral nitrate of silver, there was a yellow

precipitate; and the same result ensued from the action of ammoniacal nitrate of silver. All these precipitates became brown in a short time, and formed a new brown precipitate. The report then proceeds as follows: "We submitted this liquid to the test of Marsh's apparatus Whilst this was doing, some of the chemists fancied that they recognised for an instant a slight garlic (arsenical) odour; others did not perceive it; some obtained a brilliant brown stain infinitely slight. Dissolved in nitric acid, it gave no brick-red colour by ammoniacal nitrate of silver. We operated upon a portion of the stomach, heart, intestines, brain, bladder, and lungs, with distilled water, and for this purpose boiled the whole, cut into very small pieces, for six hours, renewing the water as it evaporated. When cold it was filtered, and the filtered liquid was evaporated until dry. What remained in this state was divided into two portions, one of which, weighing 7 grammes, was heated with 31 grammes of nitric acid, as in our first experiment. The charcoal which resulted was exposed for an hour to the action of boiling distilled water, and the filtered liquor was submitted to the same tests as for the first operation by Marsh's apparatus, and we did not obtain any trace of arsenic. We formed a new precipitate with sulphuric acid, sharpened with a few drops of hydrochloric acid, and filtered. The precipitate which remained was dissolved in water slightly ammoniacal, and then evaporated to dryness. The result was mixed with an equal weight of black flux, and placed in a reducing tube. We heated this to a red heat without obtaining any incrustation of metallic arsenic."

The above report was signed by Messrs. Dubois, sen. and jun. chemists, of Limoges; M. Lespinatz, physician, of Lubersac; M. Massenat, physician, of Paris; M. Tournadour, physician, of Uzerches; M. Lafosse, jun., of the same place, chemist; and Messrs. Fillel, Fage, and Bori, chemists, of Tulle. The Advocate-General put some questions to the chemists. M. Dubois, in reply, said, "Let the most celebrated chemists be employed. Enough of the body remains to convince the most incredulous" M. Lespinatz declared that as a physician he had believed there was a poison, but as a chemist he had not discovered any. He acknowledged his ignorance of the new process which had been used. M. Massenat also confessed that he had been in error. M. Paillet, Mad. Laffarge's counsel, observed that "The liver, the bowels, the lungs, the bladder, the stomach, every matter that it contained, and had been vomited from it, had been analysed. I cannot, therefore, comprehend how any doubt can be longer entertained as to the non-existence of poison." The Advocate-General nevertheless maintained that the evidence against the prisoner was still strong, and he should not abandon the prosecution. The court adjourned at half past six. At seven in the evening it was announced that the court had ordered that further experiments should be performed by chemists of Paris, and that Messrs. Orfila, Chevalier, and Devergie, had been named.

At the sitting on the 14th September, M. Orfila rendered an account of his labours. He read the following detail of the experiments he had employed, and came to the conclusion that he had detected the PRESENCE of ARSENIC in the body of M. Laffarge! Addressing the court in the name of himself and MM. Ollivier d'Augers and Bussy, amidst profound silence and the deepest attention, he said,—"We come to render an account of our labours. All the experiments have been made with the tests employed by the chemists who preceded us; but we employed a certain quantity of potassa, which we brought from Paris, and which those gentlemen did not think of using. These experiments were made in the presence of at least eight members of the commission. The following are the results:—1. "I will show that there was arsenic in the body of Laffarge. (General stupor. The prisoner remained motionless.) 2. That this arsenic does not result from the tests with which we operated, nor from the earth surrounding the coffin. 3. That the arsenic extracted by us is not of that arsenical portion which exists naturally in the body of man. 4. And finally, I shall show that it is not impossible to explain the diversity of results and opinions of the other experiments when compared with our own.

"1. Arsenic exists in the body of M. Laffarge. We commenced our operations with treating one quarter of the stomach which remained, the vomited matter, and the liquids found in the stomach. These three matters united being carbonised by means of nitric acid, according to the process which I indicated eighteen months ago for the first time, and the carbon produced having been treated with water, we introduced the liquid resulting from it into Marsh's apparatus to obtain an inconsiderable quantity of arsenic, which is now deposited on a plate in our laboratory. A second experiment was made with the mass, described in the *procès verbaux* as the mass arising from the organs of the thorax, the abdomen, the liver, part of the heart, and certain portions of the liver and brain. We divided this into two parts. The whole being at first mingled, we boiled it for some hours with distilled water; the liquor from this, after being passed through linen, was

reduced by heat to nearly dry matter. A portion remained undissolved, as in the case with meat when boiled—a part dissolves, the rest does not. The decoction being evaporated to desiccation was carbonised by nitric acid, in the same way as the first matter. We operated as we did before, and we again extracted arsenic from this liquid. The quantity of arsenic obtained from this decoction was nearly equal to that which we produced by the first experiment.

"We now felt it our bounden duty to examine minutely the remaining portions which had not been dissolved. As we should have been impeded with a great quantity of froth had we treated it with nitric acid, we did as I indicated 18 months ago—we burnt it with nitrate of potass. It burnt seven hours, and after treating this incinerated mass as before, we obtained a remarkable quantity of arsenic, which may be estimated at twelve times that which was produced by our first experiments. We did not feel it necessary to act upon the totality of our produce. We examined the pieces of flesh taken from the left thigh of the corpse, and made it the subject of a distinct operation. We obtained nothing from these two pounds of muscular flesh treated in the same manner as above. These, compared to the weight of the muscular flesh of the whole body, represent but a very small portion. The result upon this point, therefore, was negative. We examined a portion of the winding sheet in which the body was wrapt; we examined it with great care; we boiled it in water with potass, and afterwards put the liquid into Marsh's apparatus, and we obtained nothing. This, therefore, was another negative result. Finally, we examined two of the three portions of earth collected. Our analysis was applied to those taken from immediately over and under the coffin. These two portions were boiled separately in distilled water for four hours, and produced a mass which, on being submitted to Marsh's apparatus, did not give any arsenic. Thus it results from this first part of my deposition, and the experiments which have been made, that there was arsenic in the fourth part of the stomach which remained in the liquids contained in the viscera, and in the matter vomited, but there was not much. It results, in the second place, that in the decoction made with the organic fragments there was much, and in the solid residuum of this decoction a great deal more. Lastly, it results that we did not find any elsewhere.

"2. The arsenic found did not arise from the reagents employed. These reagents had been already employed by the chemists from Tulle, and the proof that they do not contain arsenic is, that these chemists came to the conclusion that there was not any. If there had been any in the reagent they would at least have ascertained the presence of such arsenic as might be found in them. We ought to observe, that we never put Marsh's apparatus in action until we were certain that it would operate during a quarter of an hour or twenty minutes, without any accident happening. The nitric acid has been distilled with nitrate of silver. It is impossible in this state that it should contain any arsenic. No doubt can be entertained on this point. The arsenic found cannot have arisen from the earth, because the coffin remained whole except a small crevice at the bottom. Besides, the earth produced none on being analyzed.

"3. Does the arsenic found come from that arsenical portion which is found naturally in the human body?—It has been acknowledged from my experiments, that there exists in the bones of man, and many other species of animals, an infinitely small quantity of arsenic, but it is equally ascertained that by the means we have at our command we can never produce the least trace of arsenic either from the stomach, the liver, the spleen, the kidneys, the heart, or the lungs of man. Now, we have operated not upon the bones, but upon the internal organs. What we have extracted is, therefore, not normal arsenic.

"4. It is not difficult to explain the diversity of the results obtained by us comparatively to those which were furnished by the chemists who had previously examined the body and liquids. To prove this, I will follow the series of operations which have been made. On the first report, MM. Bardou, Lespinatz Tournadour, Massenat, and Lafosse operated. They boiled the stomach—they treated the decoction with sulphuric acid—they obtained a yellow precipitate, flaky and soluble in ammonia, characters which belong to all arsenical acids. They then sought to reduce this sulphate of arsenic to its metallic state. Their tube burst. The matter they obtained did not sufficiently establish the presence of arsenic, as I said in the letter I had the honour of addressing to M. Paillet:—"Medical jurisprudence is not satisfied with suppositions, it requires positive proofs. The metal must be reproduced." With the knowledge I have gained by making the experiments on the body of M. Laffarge, I am convinced that these gentlemen, if their tube had not been broken, would have found metallic arsenic. This first experiment therefore cannot be opposed to ours, because it was never brought to a conclusion. In the second report Messrs. Dubois and Dupuptren proceeded separately, and at first on a quarter of the stomach, afterwards on the liquids it contained, and lastly on a portion of the matter vomited. Thus

there were three operations. Now, we have united these three matters and made but one operation, and instead of acting separately upon each of the three, we have acted upon them all together. Although we have thus acted, the quantity of arsenic obtained is extremely minute. Is there anything extraordinary in this—that an individual should be unsuccessful in making experiments on one-third of a mass, while he who acts on the whole should be successful? Marsh's apparatus is of a recent date. It has not yet been perfectly studied by every one, and even those who have studied it frequently find themselves embarrassed in using it. Thus to-day, even when we were going to take out some arsenic which remained in it, all of a sudden, although we were certain it was still there, we could not obtain it. This arises either from the flame being too strong, the porcelain plate being put too near, or not near enough, or from a door being opened, and the draught turning the flame in another direction, or other causes. It is not then extraordinary, that when quantities so small are operated upon, no result should be arrived at.

I take pleasure in doing justice to the talents and abilities of those gentlemen who have made the experiments, but it is evident they have acted upon too small a quantity of matter, and that Marsh's apparatus has been used with a flame a little too strong, and the small quantity of arsenic existing has been volatilized. I see nothing which is inconsistent with the result we have obtained. In fine, in the last experiment, made after exhumation, the united chemists operated upon only a very small portion of the liver. They treated it with distilled water, but they did not act upon it with nitric acid, and in this matter they found nothing. We have operated on the whole of the viscera, and found only a small portion of arsenic. These gentlemen afterwards operated upon only a fourth of the other viscera, while we made our experiments upon the whole. I admit that the process followed by these gentlemen is indicated by certain writers. If it is not the best, it is not the fault of those who used it. In this matter there has been great progress made in latter times. Thus it was not sufficiently considered that animal matter mixed with arsenic retains the poison for a long time, and is with difficulty separated from it by boiling, and hence it has been that in many instances poisonous matters have escaped the researches of chemists.

Having now gone through all that I had to lay before the court, I am bound to add that no doubt can remain as to the nature of the matter we have obtained. Metallic arsenic has been collected on the plates, and the commission, composed of three persons, to whom were joined all the other chemists, will, I do not doubt, unanimously declare that the metal obtained on the capsules is arsenic. But this is not sufficient. It must be stated by what means we are assured that it is arsenic. The stains are brown and shining; they do not attract the moisture of the air, they do not become volatilized by the cold, but the instant heat is applied they disappear. They dissolve and detach themselves instantly on the application of pure nitric acid, and this solution being complete, if it is evaporated into dryness, it gives a white residuum, with a light yellow tint, which nitrate of silver converts into a brick-red. No other substance unites in itself these characters, and therefore I am bound to conclude that the matter is arsenic."

M. Ollivier and M. Bussy signified to the court that they fully concurred in all M. Orfila had stated.

ON HACHISCH.*

In a work lately published by Dr. Aubert, that gentleman has devoted an article to a peculiar substance, to which M. de Sacy had given the name *hachisch*, and which is very extensively used among the Arabs, and which produces a kind of intoxication. Dr. Aubert has examined this vegetable: the following is what he says of it:—

"If we examine the leaves, flowers and seeds of this plant, we might almost recognise a kind of hemp. Hachisch is indeed of the same family and genus. It is an annual plant which grows in all parts of Lower-Egypt, where it is largely consumed and is in great demand. We are assured that it is cultivated also in Syria, and some parts of Asia-Minor. The difference which exists between hemp and hachisch is in the stem: the latter is not more than two or three feet high at most; its stem branches from the foot. The branches are alternate, and there are not met with on its stem those filaments which are observed on that of hemp: its smell is not so strong as that of hemp, and is rather peculiar. The commonest and most certain means of experiencing its effects consists in making a decoction of this plant: when it is finished fresh butter is added, and the whole is left on the fire until the liquid is completely evaporated; the butter is then strained through a cloth; it has then become of a fine green color. It is used in combination with sugar, pistachios and other ingredients."

The following are the effects which Dr.

* *Journal de Chimie Médicale*, August 1840.

Aubert says he has obtained: we use his own words:—

"I have taken it under the form of lozenges of a greenish color, having a sickly taste, but very much disguised by the pistachios and the essences of rose and jessamine. Its effects on me were not very marked; not knowing the substance, I was prudent. One of us imagined that he was going to die of apoplexy in the night, and delivered us discourses on life, and on the manner in which we ought to conduct ourselves. I was much astonished at the gaiety which arose, the strange ideas which were given out, and those which ran through my head.

"A few days after I doubled the dose, and I sat myself in the divan, taking coffee in order to develope the effects of this substance. I was talking when I felt a kind of pricking in my feet, and a compression in my head, which suddenly dissipated; my head seemed to be empty. I then experienced peculiar sensations; every thing assumed a new face; the figure of my neighbour seemed the most grotesque in the world; I burst out laughing at his nose, and this laugh continued for nearly an hour—a trifle renewed it. During this time the most strange and varied ideas passed through my head with surprising rapidity. I felt perfectly comfortable, and without one painful sensation; the past, the present and the future no longer existed. I knew but the very moment which passed by me; it was the most complete *dolce farniente*. Afterwards all became calm; I was desirous of sleeping. The whole night was one agreeable dream.

"On waking I had an accurate remembrance of what had passed; my head was not heavy, nor was my mouth clammy, as after opium or wine.

"I continued to take this substance with my friends, in order to study the effects which it produced on us.

"The first effects are, an extreme pleasure which is found in stretching oneself on a divan, in smoking and taking coffee, and a repugnance for every kind of motion. Afterwards the eyelids close, as if light were disagreeable. The strangest ideas begin to come into one's head; great laughing and extravagances, both in words and actions, follow. The Arabs call these last effects *fantasia*. In the midst of all this an almost canine appetite is felt: wine is disagreeable. The effects go on increasing and gradually cease, and the whole is terminated by a soft sleep and pleasant dreams; no headache or fatigue, or uneasiness in respiration.

"The effect on the nervous system, therefore, is mild; it is well characterised in its action by the hunger, the extravagances, and the rapidity of the ideas."

It is desirable that new trials be made, in order to confirm the curious details given by Dr. Aubert.

TO CORRESPONDENTS.

X.'s suggestion will in future be acted on.

A Subscriber.—We believe that Dr. Thomson's work on organic chemistry contains a good detail of that kind of analysis: we know of no work exclusively devoted to the subject.

C. W. R.—The chief alteration is the formation of sebacic acid.

G. and J. L.—We do not know of any work treating solely on those arts: we may recommend Dr. Ure's Dictionary of Arts, Manufactures, and Mines, as a good book of reference in all departments of chemical manufactures.

A Drug Broker.—We cannot insert our correspondent's letter: we hope that the New Medical Reform Measure will prevent oilmen and grocers, or any but druggists, from selling or compounding ANY DRUG.

R. B. M.—Care should be taken that the temperature be such as to insure a sufficient evaporation of water, in the vessel containing the phosphorus. The appearances show that the revival was not *complete;* greater power, therefore, is required.

A SUBSCRIBER is informed that the Monesia, or, as it has lately and more correctly been termed, Buranhem, may be obtained at Messrs. Savory and Moore's, New Bond Street. We have not seen the formula in question.

M. F. I., Truro.—We cannot give insertion to such twaddle. Our correspondent rightly estimated the value of his communication in considering it not worth his while to pay the postage of it.

RECEIVED.—The Prospectus of the London Mechanics' Institution. Among the Lectures to be delivered during the present quarter are a course of four on the Metals by R. H. Semple, Esq.; and one of six on the Nutritive Processes in Animals, by R. D. Grainger, Esq.

WANT OF SPACE again compels us to defer answering many of this month's correspondents.

NOTA BENE.—*All Communications and Books for Review must be addressed, "To the Editors of The Chemist, care of Mr. Hastings, Publisher, 13, Carey-street, Lincoln's Inn Fields, London." Communications must be pre-paid, and sent before the 15th of each month.*

STEWART AND MURRAY, PRINTERS, OLD BAILEY.

THE CHEMIST.

I. CHEMISTRY.

EXTRACT FROM A MEMOIR ON THE ESSENTIAL OILS.*

BY M. PELOUZE.

ESSENCES EXTRACTED FROM THE DRYOBALANOPS CAMPHORA.

I am indebted to the kindness of Dr. Christison of Edinburgh for the two very rare substances, the consideration of which is the chief object of this paper.

One of these matters is solid, and is known by the name of *camphor of Borneo*: the other is fluid, and is called *liquid camphor*. Both are extracted from the *Dryobalanops Camphora*.

The solid matter is found in the cavities of the trunk of the old trees. When the trees are young they do not contain solid camphor: but on making incisions in them, a liquid of a greenish yellow color flows out. It is an essential oil mixed with about five or six hundredths of its weight of a peculiar resin, differing from camphor. This essence, which is the liquid camphor of Borneo, is very much used in the East, where it has long been employed, it is said successfully, in rheumatic affections. Solid camphor forms part of the Materia Medica of the Chinese, who class it among their aphrodisiacs.

Thus, according to Dr. Christison, to whom I owe the foregoing information, the *Dryobalanops camphora* produces three substances differing in nature from essences or resins, namely, the two camphors and a resinous body, which are found in solution in the essential oil of Borneo, from which it may be separated by distillation.

The sample of essence sent me by Dr. Christison had undergone this operation: consequently, I was obliged to limit my work to the examination of the two essences.

CAMPHOR OF BORNEO.

It is presented in small crystals, or rather in fragments of white crystals, transparent, very friable, of an odour partaking of that of ordinary camphor, and of that of pepper, and of a hot and burning taste, like that of essences in general. Its density is inferior to that of water. It is very sparingly soluble in that liquid, and very soluble, on the contrary, in alcohol and in ether.

According to the symmetry of the faces which yet remain in the crystals, all of which are more or less defaced, it would appear that its form is a prism with six regular faces, arising from a rhomboidal system.

The camphor of Borneo enters into fusion at 198° C., and into ebullition at 212° C. At this temperature, it distils without undergoing any alteration. The thermometer, plunged into the bath, remains stationary from the commencement to the end of the sublimation, and the distilled matter is always in every respect identical with the camphor of Borneo in its natural state.

Many analyses of the concrete substance of Borneo have given me, for its composition, the formula: $C^{20}\ H^{36}\ O^{2}$. These analyses were sometimes made with the finest samples of the camphor of Borneo, and sometimes, with the matter sublimed, or deposited in neutral solvents. MM. Frémy and Deville, who have been kind enough, at my request, to repeat my analyses, have arrived at the same results.

The numbers $C^{20}\ H^{36}\ O^{2}$ represent four volumes of the camphor of Borneo. A temperature of from 240 to 250 degrees being insufficient for altering the concrete essence, its density of vapour may be determined with great accuracy.

Slightly heated with anhydrous phosphoric acid this camphor is suddenly decomposed with production of heat, and without any disengagement of elastic fluid. Water is

* *Académie des Sciences:* Sitting of August 31, 1840: *Comptes Rendus*, No. 9.

formed, which combines with the phosphoric acid, and a new hydro-carbon, isomeric with the essence of turpentine and the numerous hydro-carbons which MM. Soubeiran and Capitaine designate under the name of camphenes.

The formula of this hydro-carbon is $C^{20}\ H^{32} = C^{20}\ H^{36}\ O^2 - H^4\ O^2 = 4$ vol. of vapour.

Some chemists are of opinion that the essential oils, thus decomposed by phosphoric acid into carburetted hydrogen and water, ought to be looked upon as containing binary compounds, quite formed, and ranked in the series of alcohols, when the hydro-carbons which they contain have the faculty of uniting with the hydracids. This view being adopted, the camphor of Borneo would have for a formula,

$$C^{20}\ H^{32},\ 2\ H^2\ O.$$

But this is a pure hypothesis, from which it appears to me impossible to draw any probable inference as to the constitution of essential oils. It may easily be conceived that, on one part the great stability of water, and on another part, the great affinity of anhydrous phosphoric acid for it, determines the re-union of all the oxygen of the organic matter with a corresponding quantity of hydrogen in order to form water, which did not exist while the remainder of the hydrogen was combined with the whole of the carbon.

The liquid camphor of Borneo has a peculiar odour which is not camphory, and which very much resembles that of essence of turpentine. It is lighter than water, and almost insoluble in that liquid; it boils at about 165° C.

Dried over chloride of calcium, it presented the same composition as the carburetted hydrogen extracted from the solid camphor, by anhydrous phosphoric acid. It absorbs the same quantity of hydro-chloric acid gas as essence of turpentine. However, M. Biot, who has been kind enough to examine it, has found a different molecular condition.

Left to itself in a partially closed vessel, the liquid camphor of Borneo is very rapidly oxidized. Its formula, which at first was $C^{20}\ H^{32}$, becomes $C^{20}\ H^{32}\ O^4$. This absorption of oxygen, remarkable for the rapidity with which it takes place, does not appear to be accompanied with any formation of carbonic acid. Unfortunately, I had too little essence of Borneo to give much scope to the study of that substance.

M. Theodore de Saussure has long since proved that the essential oils in general absorb a great quantity of oxygen in contact with the air, and that they produce a considerable quantity of carbonic acid, but less however than the quantity of oxygen absorbed. It does not appear that this is always the case, when the essential oils have been carefully purified before their contact with the oxygen of the atmosphere. The liquid essence of Borneo presents an example of the contrary.

The essential oil of lavender, when very pure, produces a volume of carbonic acid which does not amount to $\frac{1}{100}$ of the oxygen which it absorbs.

The *Dryobalanops Camphora* secreting, while young, an almost pure essential oil, whose composition is $C^{20}\ H^{32}$, and producing, at a more advanced age, another essence, whose formula is $C^{20}\ H^{36}\ O^4$, it seems natural to believe that the latter substance, that is to say, the solid camphor of Borneo, derives from the liquid camphor which would have fixed, in the course of vegetation, the elements of a certain quantity of water. It would be interesting to examine, at different periods, and under a similar point of view, all the vegetables which produce essential oils and resins. The result of such investigations, doubtless, would enlighten us on many obscure points of organic chemistry; for little or nothing is known of the relations of composition and formation which exist, or may exist, among the essences and resins secreted by the same vegetables.

It has been thought that the most important resin, colophane, the formula of which is supposed to be $C^{20}\ H^{30}\ O^2$, is produced by the oxidation of essence of turpentine, which is $C^{20}\ H^{32}$. M. Laurent has shewn that the different isomeric acids whose mixture constitutes colophane, were composed in the atomical proportions of $C^{20}\ H^{30}\ O^3$; so that, relying on these analyses, colophane, if it be derived from essence of turpentine, should be produced all at once by the removal of the hydrogen and by the oxidation of the latter resin. As two equivalents of oxygen replace only one of hydrogen, it would be well to ascertain if an intermediate product, $C^{20}\ H^{30}\ O$, does not precede $C^{20}\ H^{30}\ O^2$, and if, in very young trees, which secrete turpentine, this hydro-carbon is only concentrated, like the liquid essence of Borneo, in the *Dryobalanops Camphora* which has not attained its full development.

As to the inferences which possibly might be drawn from the examination of the products of the *resinification* of essences, they would be very vague, and often even erroneous. In proof of this assertion, I may mention the essence of turpentine.

Left to the solar radiation, it is gradually changed into a viscous matter which resembles natural turpentine, and which gives, by evaporation, a matter completely resembling colophane in odour and appearance. But it would be wrong to confound this matter with colaphane, for I have found it to have a different composition. Besides, it is accompanied by a liquid, oxygenised essence,

which arises in the air at the same time as it, and which is not found in recent essential oil of turpentine that has been kept in well-closed flasks.

From the preceding observations, concerning which I will say more in a future Memoir, it very evidently results that the resins which arise from the slow action of the atmospheric air on the essential oils, ought not to be confounded, if not always, at least in certain cases, with the resins produced during vegetation.

Chemists have long been acquainted with a combination of hydro-chloric acid and essence of turpentine, which has improperly been designated *artificial camphor*. This substance resembles ordinary camphor only in its odour; its composition is essentially different, since it contains chlorine, which is not one of the elements of ordinary camphor. As yet camphor has not been artificially obtained. The concrete juice of the *Dryobalanops camphora*, setting aside its odour, does not seem to be more analogous to camphor, than any other oxygenous essence. This odour alone has obtained for it the name of camphor, as is the case with the artificial camphors of turpentine and lemon.

On boiling the concrete essence of Borneo with nitric acid of average strength, abundant reddish vapours are disengaged, while a liquid of an oily appearance floats on the surface of the acid. Water, added to this species of oil, precipitates from it white light amorphous flocks, which have the smell of ordinary camphor, without its clearness. Collected, washed, and filtered, these flocks present all the characters of laurel camphor. The same composition, the same terms of fusion and ebullition, on both sides of liquefaction in hydro-chloric acid gas, absorption of the same quantity of that acid, —in a word, complete identity.

If nitric acid at its maximum of concentration be poured on the concrete essence of Borneo, a considerable disengagement of heat, accompanied by a great quantity of reddish vapours, is immediately manifested. To avoid an explosion, small quantities of matter must be operated on. In this case, the formation of the compound of nitric acid and ordinary camphor is crystallised; with less concentrated nitric acid, it must be heated to produce the effect; when cold it acts very slowly. In all cases, the formation of the camphor of Borneo into ordinary camphor, is uniformly accompanied by reddish vapours of deutoxide of nitrogen.

Is the camphor of Borneo a mixture of ordinary camphor and water, or of several other matters not ascertained? Or, indeed, is it a definite combination, of which camphor forms a constituent part?

Without resorting to experiment, the first question may be answered in the negative. All the properties which constitute a chemical species are found in the camphor of Borneo.

As to the second question, that of the pre-existence of a combination of ordinary camphor in the concrete essence of Borneo, it is scarcely possible to resolve it in a positive manner. However, I think there is nothing to warrant such an opinion. Ordinary camphor combines with acids,—not only with the mineral, but with certain organic acids, as for example, camphoric acid. But as nitric acid, which is made to act on the concrete essence of Borneo, does not produce less than 96 per cent. of its weight of ordinary camphor, it is impossible to admit that the three or four hundredths of matter which are wanting, represent the acid required for saturating camphor. Again, hydro-chloric acid combines with the concrete essence of Borneo, without liquifying it, and by heating the combination the essence is extracted unaltered.

Is the camphor of Borneo a hydruret of ordinary camphor? For example, is it to the latter, what white indigo is to blue? Nothing authorises this supposition: a host of organic matters produce oxalic acid on being treated by nitric acid, without being considered to contain oxalic acid.

The concrete essence of Borneo containing carbon and oxygen in the same proportions as ordinary camphor, and differing from it only by containing a more considerable proportion of hydrogen, it may very well be conceived that the oxygen of the nitric acid carries its dehydrogenising action to the excess of hydrogen to form water, and that the remaining elements combine in order to produce common camphor, whose combination with nitric acid presents great stability. With so energetic an agent as nitric acid, it is not necessary, in order to account for the presence of camphor in the above-mentioned case, to admit its pre-existence in the concrete essence of Borneo.

In a future Memoir on the essential oils and on their relations with the resins which correspond with them, I shall take an opportunity of reverting to the subject which I have just thus slightly touched upon.

For the present I wished to communicate to the Academy the interesting fact of the artificial production of the ordinary camphor of commerce—of a camphor identical with that of the *Laurus camphora*.

In conclusion, I may add that M. Biot has found in the artificially produced camphor, a power of rotation which proceeds in the same direction, and which has the same intensity as that of ordinary camphor; and that he has thus given to my results such a

confirmation, that no one, I hope, will hesitate to consider them as definitively acquired to science.

NEW INVESTIGATIONS CONCERNING ESSENCE OF TURPENTINE.*

BY M. DEVILLE.

I think I have arrived at the demonstration of this principle that essence of turpentine being considered as a homogeneous substance, gives rise to an unlimited number of substances isomeric with it, and exhibiting, in certain cases, such chemical and physical characters as to permit the differences among themselves and between themselves and essence of turpentine to be very clearly established. The law which regulates their formation is very simple: every reagent which acts on essence of turpentine and on these substances, to disengage them from a combination of which they form part, modifies them in their molecular state and converts them into other substances, which sometimes have nothing in common with that which has given rise to them, except their elementary composition. Thus, therefore, every reaction creates a new body.

It is under these circumstances that the liquid camphors (hydro-chlorate, hydro-bromate and hydriodate) of turpentine are produced. The same also, when it is wished, by treating these camphors, and even solid camphors by lime, to remove from the acid the oily base which it retains, there is always obtained, not that base itself, but a body isomeric with it. The latter is capable of producing a third substance after its combination with an acid, and the destruction, by an alkali, of the compound which results. In a catalogue, which might be made, of these bodies derived from essence of turpentine, the number of reactions which were necessary to their production, would determine the class to which they should belong.

I first studied the series of bodies which give rise to liquid products. The base of liquid camphor, terebene, which cannot be separated from its combinations, but which I have found in one of the results of the action of concentrated sulphuric acid on essence of turpentine, yielded by its combinations with the haloid acids, mono-salts and bi-salts, whose common character was the complete absence of rotation, which is also wanting in terebene.

I proved that hydro-bromic and hydriodic acids gave artificial camphors, with essence of turpentine, the hydro-bromate alone being solid and crystallised, and resembling the corresponding hydro-chlorate so much, that it is impossible not to confuse them by sight and smell. The oily bases of these combinations (M. Dumas' camphene), have the same rotation, the same also as essence of turpentine. The hydriodate of camphene is liquid. Hydro-fluoric acid is the only haloid acid which enters into no combination.

The distillation of colophane, repeated a great number of times, gave exactly the same results as the action of sulphuric acid on essence of turpentine, namely, terebene, and a new body, isomeric with the essence, colorless, viscous, boiling at 315° C., volatile without decomposition, and rather less dense than water. It has no rotation.

I have also studied some of the substances of the second formation, which arise from a molecular alteration undergone by the bodies which are derived from essence of turpentine.

Indeed, I have obtained chloric and bromic combinations isomeric among themselves, and which result from the decomposition of the essence and the bodies derived from it, by chlorine and bromine. They have this feature in common, that heat decomposes them, yielding carbon, hydro-chloric or hydro-bromic acid and hydro-chlorate or hydro-bromate of the base which has been, to prepare them, treated by chlorine or bromine. Thus the chloro-camphene C^{40} H^{34} Ch^8 gives carbon, hydro-chloric acid and hydro-chlorate of camphene (solid artificial camphor). Chloro-terebene gives the same products, except that the camphor which is produced is liquid.

Besides, I have obtained with colophane that body which is extracted from colophane, which is produced also in the action of sulphuric acid on the essence, the combination C^{80} H^{64}, Ch^8 which corresponds with colophane C^{84} H^{64} O^4 and which has all the appearance of it.

Chlorine and bromine, in acting on essence of turpentine, give bodies which have the same composition, $C^{40}H^{24}Ch^8$, $C^{40}H^{24}Br$, as those which I formerly spoke of. I remarked that terebene and essence of turpentine, which are of the same density, give rise to products with chlorine and bromine, also of the same density.

This chloride and this bromide of essence of turpentine may be considered as mixtures or combinations of chlorides and bromides of camphene and terebene. They also yield, by distillation, carbon, hydro-chloric and hydro-bromic acids and mixtures of liquid and solid camphors, or hydro-chlorates and

* *Académie des Sciences;* Sitting of Sept. 7: from *Comptes Rendus*, No. 10.

hydro-bromates of camphene and terebene. In the same manner colophane may be considered as a mixture of oxides of camphene and terebene.

ON A NEW SALT OBTAINED FROM IODINE AND CAUSTIC SODA.*

BY PROFESSOR FRED. PENNY.

While examining the action of iodine on carbonate of soda, a salt was obtained, which crystallized in regular six-sided prisms, and which gave by analysis sodium, iodine, and oxygen, in proportions not corresponding to any known compound of these elements. The same salt was also prepared by saturating a solution of caustic soda with iodine, and allowing the solution to evaporate spontaneously. At first, this salt was thought to be the same as that described by Mitscherlich in his Elements of Chemistry, and to which he gives the following composition $Na\,I + Na\,O,\,I\,O_5 + H\,O_{20}$; but the analysis gave very different results.

Professor Penny gave the following characters of this salt:—

It is white and inodorous, has a sharp, saline taste, crystallizes in short six-sided prisms, is soluble in cold and hot water, and is decomposed by alcohol into iodate of soda and iodide of sodium. It effloresces on exposure to the air, and is very readily decomposed by heat; abundance of water is first evolved, and then oxygen with a trace of iodine. Its solution is perfectly neutral to test papers, gives a pale lemon yellow precipitate with acetate of lead, yellowish white with nitrate of silver, and a fine bright yellow with pernitrate of mercury. It is not affected by solution of starch, but is instantly decomposed with precipitation of iodine by nitric, sulphuric, acetic, and hydrochloric acids. The latter acid in excess converts it wholly into chloride of potassium.

Professor Penny detailed a very remarkable circumstance attending the formation of this salt from iodine and caustic soda. When the solution is allowed to evaporate spontaneously, long prismatic crystals of iodate of soda are deposited; but as the evaporation continues, these crystals are re-dissolved, and are replaced by those of the new salt. In one experiment this change was very striking. The solution on Saturday night had deposited an abundance of fine crystals of iodate of soda, but on Monday all these had disappeared, and a crop of the new salt had crystallized. The prior deposition of iodate of soda generally occurs in the preparation of this salt; and from other experiments it seems necessary that there should be an excess of iodide of sodium in the solution, and that the solution should be strong, in order that the salt may form. When this salt is dissolved in water, and the solution evaporated spontaneously, crystals of iodate of soda deposit, but very few of the new salt will form.

The salt may also be procured by pouring a saturated solution of iodide of sodium on crystals of iodate of soda, and setting them aside for some days. The crystals will be dissolved and will be replaced by crystals of the new salt.

Professor Penny then gave the details of his analysis of this salt, and the following formula, as agreeing best with his results:— $Na_3\,I_2\,O_{12} + 38\,H\,O$; or, regarding it as a compound of iodate and iodide, it may be thus represented:— $3\,Na\,I + 2\,Na\,O\,I\,O_5 + 38\,H\,O$. According to this view, it is the sesqui-iodide of iodate of soda.

* Read to the British Association at the Glasgow Meeting; from *The Athenæum*.

ACTION OF NITRIC ACID ON THE CHLORATES, IODATES, AND BROMATES OF POTASSA AND SODA.†

BY PROFESSOR F. PENNY.

This communication contains the details and results of experiments undertaken with the view of confirming the correctness of the author's researches on equivalent numbers. In this he has been disappointed, the action being attended by circumstances which render it inapplicable to so delicate a purpose as the determination of equivalent numbers. However, the results that he has obtained are new, and he considered them sufficiently interesting to be worthy the attention of the Section.

In order to examine the action of nitric acid upon chlorate of potassa, a known weight of the salt was mixed in a retort with a measured quantity of the acid, and the mixture was heated on a sand bath; as soon as it became warm, chlorine and oxygen were evolved in a state of mixture and not of combination, and the chlorate gradually disappeared. The solution was then evaporated to dryness, and the saline residue was found to be a mixture of hyperchlorate and nitrate of potassa, in the proportion of three equivalents of the latter to one of the former. The author thus expresses the reaction which takes place:— $4(K+Cl+O_8)$ and $3(N+O_5) = (K+Cl+O_8)$ and $3(K+N+O_6)$ and Cl_2 and O_{13}

The action of nitric acid on chlorate of potassa differs, then, from the action of sul-

† Communicated to the British Association at the Glasgow Meeting; from *The Athenæum*.

phuric acid on the same salt. With nitric acid the salt is tranquilly decomposed, and the chlorine and oxygen liberated uncombined, whereas with sulphuric acid these gases are evolved in a state of combination, forming that dangerously explosive compound chlorous acid. Nitric acid, therefore, is to be preferred for the preparation of hyper-chlorate of potassa, as with it the operation may be conducted without those violent detonations that are so apt to occur with sulphuric acid. The action of nitric acid on chlorate of soda is the same as upon chlorate of potassa. The chlorine and oxygen set free are in a state of mixture, and every 4 atoms of chlorate yield 3 of nitrate and 1 of hyper-chlorate.

Hyper-chlorate of soda is a very soluble salt, and crystallizes in small rhombs. It is readily decomposed by heat, but is not acted on by hydrochloric acid. It deliquesces on exposure to the air.

The action of nitric acid on an iodate is very different from that on a chlorate, and is well illustrated in the case of iodate of potassa. When iodate of potassa is boiled for some time with a great excess of nitric acid, it is decomposed into potassa and iodic acid, the potassa combines with its proportionate quantity of nitric acid, forming nitrate of potassa, and the iodic acid is deposited from the solution in minute, hard, and transparent crystals. If the acid solution of nitre, containing the iodic acid, be then evaporated, a re-action takes place: the iodic acid decomposes half of the nitre, liberates its nitric acid, and combines with the potassa, forming the biniodate. This change is completed when the mixture is dry, and if the heat be then withdrawn, a definite mixture of biniodate and nitrate is obtained. If the heat be continued, a still further change occurs, the iodic acid expels the whole of the nitric acid, which is evolved as nitrous acid, and oxygen and neutral iodate of potassa remain. By adding fresh nitric acid to this iodate, the same changes may be produced by a proper regulation of the temperature.

By acting upon iodate of soda with nitric acid, Prof. Penny has formed a biniodate of soda, and by adding a considerable excess of iodic acid to a solution of iodate of soda he has obtained a teriodate of soda. Both of these salts are anhydrous. The biniodate of potassum contains one atom of water. He also finds that crystals of iodate of soda contain various quantities of water, according to the strength of the solution from which they have deposited. From a hot and strong solution this salt crystallizes in acicular tufts, and the thus procured crystals contain two atoms of water. If the solution be rather weak, long four-sided prisms are obtained, and these crystals contain six atoms of water. If a solution of iodate of soda be allowed to evaporate spontaneously, large irregular prisms deposit, and these contain ten atoms of water. They effloresce rapidly on exposure to the air, and in this way lose eight atoms of water.

The action of nitric acid upon bromate of potassa was next examined, and was found to differ remarkably from the action of this acid on the chlorate and iodate. Neither hyper-bromate nor bi-bromate is produced, but merely nitrate of potassa. The nitric acid disengages the whole of the bromic acid, and this, at the moment of its liberation, is resolved into its elements, bromine and oxygen.

In conclusion, the author remarks that the action of nitric acid on these three classes of salts affords a ready method of distinguishing them from one another.

ON THE COMBINATION OF CYANURET OF MERCURY AND CHLORIDE OF POTASSIUM.*

BY M. LONGCHAMP.

The cyano-chloride of mercury and potassium is white, very light, and in silky needles. It is a compound of cyanide of mercury, two atoms; chloride of potassium, one atom.

The heat of the sand-bath disengages from it 4 per cent. of moisture; but M. Longchamp does not admit that this is combined water. He presents some new views concerning the nature of the force which determines the crystallization of salts. Taking sulphate of soda as an example, he shows that the axis of this salt is formed of an empty hexahedral prism, whence he concludes that crystillization is effected by the repulsion of the saline particles, and not by their attraction. Round the hexahedral vacuum of the axis of the crystal of sulphate of soda, is formed a hexahedral coating of salt; the repulsion of the particles of this coating operating on the saline particles which surround it, a new vacuum is formed, and, round it, a new coating of saline particles; and thus is the crystal formed successively of a vacuum and a saline side. But if it be thus, salts in crystallizing should augment the volume of the mass in the midst of which they are formed, as water does; and this is indeed a demonstrated experiment. If a small matrass of blown glass be filled with a boiling saline solution, the bowl of the matrass cracks as if it were water passing to the state of ice.

M. Longchamp sets forth that combination is possible only among bodies of analo-

* *Comptes Rendus*, No. 8, Aug. 24.

gous nature; then comparing cyanogen to chlorine, bodies whose analogy has long been acknowledged, he thinks that instead of concluding from it, as has been done, that cyanogen often acts like a simple body, from analogy it should be inferred that chlorine is a compound body.

ON THE ALTERATION OF TARTARIC, RACEMIC, CITRIC, MUCIC AND GALLIC ACIDS, BY THE PEROXIDES OF LEAD AND MANGANESE.*

BY M. J. PERSOZ.

M. Döbereiner was the first who made known the curious fact of the conversion of tartaric into formic acid, under the double influence of sulphuric acid and peroxide of manganese, which conversion has been explained by admitting that the sulphuric acid decomposes the peroxide of manganese into the protoxide, with which it forms a salt, so that one equivalent of oxygen is set free and combines with the elements of tartaric acid, converting them into carbonic and formic acids, according to the equation

$$3\,Mn\,O^2 + 3\,\ddot{S} + C^4H^4O^5 = \begin{cases} C^2\,H^2\,O^3 + Aq. \\ C^2\,O^4 \\ H^2\,O \\ 3\,\ddot{S}\,\dot{M}n. \end{cases}$$

Considerations purely physical, and which I shall develope further on in my memoir, have induced me to reject this hypothesis, and to conclude that tartaric acid is alterable by a peroxide, without the aid of sulphuric acid. With a view to proving this proposition, I put one part of tartaric acid in contact with five parts of peroxide of lead and ten parts of water. The action took place at the ordinary temperature, and was manifested by an abundant disengagement of carbonic acid gas; the gas extinguished tapers, rendered lime water turbid, and was entirely absorbed by the alkalies. The liquor was boiled for a few minutes and filtered, in order to separate the insoluble portion, then evaporated and concentrated, so that, left to itself, it deposited crystals by cooling, some of which were transparent and prismatic, and some opaque and rhomboidal, but which, in both cases, contained only formic acid and oxide of lead.

With respect to the insoluble part, its nature varied according to the duration of the experiment, and likewise according to the quantity of peroxide used.

In the different experiments made to ascertain the action of tartaric acid on the peroxides, the insoluble part was found to be formed, sometimes of peroxide of lead and a certain quantity of tartrate of lead; sometimes of peroxide of lead and an equal quantity of carbonate and tartrate of lead; sometimes of the peroxide and a certain quantity of carbonate of lead; and sometimes of carbonate and tartrate, when an insufficient quantity of the peroxide had been employed. The following is the manner in which the nature of this residue was ascertained. After having perfectly washed it in order to free it from the formiate of lead with which it was impregnated, it was treated, with the aid of heat, and several times, by dilute nitric acid. When the residue was insoluble in nitric acid, it was nothing more than perfectly pure peroxide of lead. Indeed, 1 gr. of this residue, calcined and immediately converted into the sulphate, gave 1·26 gr. of sulphate of lead. The liquor, cautiously neutralised with ammonia, produced a precipitate, which, being well washed and treated by sulphuretted hydrogen, contained a quantity of tartaric acid corresponding to the tartrate of lead which was formed. This acid, thus extracted, exhibited all the properties assigned to tartaric acid, and had not undergone any modification.

In the case in which the tartrate of lead formed only part of the precipitate, the neutralised liquor contained only nitrate of ammonia; but it contained nitrate of ammonia and nitrate of lead, when, during the action of the tartaric acid on the peroxide of lead, carbonate of lead was formed. This last experiment, which clearly proves that tartaric acid may, by aid of peroxide of lead, be converted into formic acid, without the assistance of sulphuric acid, is nevertheless not sufficient to justify the proposition that we wish to establish, namely, that the alteration of tartaric acid by the peroxides, occurs by virtue of an action which occasions the very interesting phenomena of oxygenised water, and that it is independent of the supposed displacing of one equivalent of oxygen, for it might be objected to us that a portion of the tartaric acid would have the same action as the sulphuric acid, that is to say, that it would effect the decomposition of the peroxide by seizing the oxide of lead, and that the equivalent of oxygen of the peroxide displaced by the tartaric acid fulfils, in relation to the other portion of tartaric acid, the same part as the equivalent of oxygen displaced by sulphuric acid. This objection seems so much the better founded as the tartrate of lead is sometimes one of the products of the reaction. However, by a more attentive consideration of the phenomena of this action,

* *Académie des Sciences*, Paris; Sitting of Sept. 21, 1840: from *Comptes Rendus*, No. 12.

there is found, in the very fact of the formation of the tartrate of lead, an argument in favor of our opinion. Indeed, if the alteration of tartaric acid by the peroxide of lead were subordinate to the previous displacing of one equivalent of tartrate of lead, the latter salt would necessarily always, and in uniform quantity, form one of the products resulting from the action which these two compounds exert on one another; now this is not the case, since, as we have said above, there are cases in which not a trace of tartrate has been found. If by this reasoning we have overcome the objection that might be made, the fact of the formation of the tartrate of lead does not the less exist, and ought also to be explained. Indeed, it is sufficient to bear in mind that one equivalent of tartaric acid requires three equivalents of peroxide of lead, in order to pass to the state of formic acid, and that in this case there are three equivalents of oxide of lead set free, only one of which enters into combination with the formic acid, whilst the remaining two remain free, or enter into combination with carbonic acid. Now, the tartaric acid in contact with the formiate and carbonate of lead, decomposes them, forming insoluble tartrate of lead, and liberating formic and carbonic acids. Thus, then, at least to admit, which cannot be, that the action of the peroxide of lead on the tartaric acid takes place on all points at once, the reaction of the tartaric acid and the peroxide should be represented as at first causing the formation of a certain quantity of basic formiate, which, in contact with the tartaric acid, is very soon after decomposed in order to be partially converted into neutral soluble formiate and into insoluble tartrate of lead. We may add, that if the latter salt is not always formed among the products of the re-action, if our opinion is correct, the tartrate of lead itself must undergo a direct decomposition on the part of the peroxide, which is proved by the following experiment. Equal parts of tartrate and peroxide of lead were boiled: an action took place which was rendered evident by the change in the state of saturation of the liquor, which soon became alkaline, and was rendered turbid on the contact of the air, depositing carbonate of lead. Filtered and evaporated, it deposited perfectly white crystals, which contained only oxide of lead, and formic acid, in the proportion of two equivalents of base to one of acid. This experiment clearly explains, therefore, how it happens that, by a more or less prolonged action, or by a sufficient or an insufficient quantity of peroxide of lead, with this latter compound and tartaric acid, may be obtained, sometimes tartrate and formiate of lead, sometimes basic formiate and carbonate of lead, and sometimes a mixture of these salts, and in variable proportions. Let us admit that an excess of peroxide of lead be made use of,—four equivalents, for example, to one of tartaric acid,—and that the action of these two bodies be stopped at the moment when the liquor ceases to be neutral, that is to say, when it begins to have an alkaline reaction in the liquor of the neutral formiate of lead, and in the neutral residue, will be found tartrate and peroxide of lead—compounds which may easily be separated by means of nitric acid. If, instead of thus stopping this action, it be continued, the tartrate soon disappears, and is replaced by carbonate of lead; the liquor holds in solution only basic formiate of lead, and the insoluble residue is then formed only of carbonate and peroxide of lead.

After having examined the action of peroxide of lead on tartaric acid, we studied that of the peroxide of manganese on the same acid, and that by employing artificial and natural peroxide. In both cases the tartaric acid was converted into carbonic and formic acids, as with peroxide of lead. However, we may remark, that formic acid produced by the action of native peroxide of manganese is always accompanied by a coloring matter which becomes perceptible by being combined with oxide of lead, for the formiate which is thus obtained has a chamois tint, from which it is difficult to free it, and which does not affect the pure formiate.

Finally, wishing to ascertain whether the analogy between the peroxides of lead and manganese is longer sustained, and if the latter would be capable of altering the tartaric acid in tartrate of lead, we boiled one part of tartrate of lead with one part of peroxide of manganese; the liquor soon became alkaline, and we easily extracted from it, by careful evaporation, formiates of lead and manganese.

From the experiments detailed in this memoir, according to the author, it may be concluded:—

1st, That tartaric, racemic, and mucic acids, free, or combined with oxide of lead, are converted into carbonic and formic acids by the peroxides of lead and manganese, without the assistance of an acid.

2nd, That citric and gallic acids are also decomposed by the peroxides, but without producing formic acid.

After this Memoir was concluded, M. Biot remarked how desirable it was that the phenomena of decomposition which it treats of might be effected by means of soluble substances, diluted in transparent solutions. For tartaric acid possessing the rotatory power, and communicating it, with special modifications, to all the bodies with

which it enters into combination, the mode and progress of its decomposition might thus be observed and followed in all their phases, as if they had become perceptible to the eye.

EXPERIMENTS FOR THE ACCURATE DETERMINATION OF THE ATOMIC WEIGHT OF CARBON.*

LETTER FROM M. DUMAS TO M. ARAGO.

Being obliged by ill health to pass a month at the waters of Aix, in Savoy, I take the liberty of addressing to you a Memoir, which M. Stass and myself wish you to present to the Academy. It is relative to the accurate determination of the atomic weight of carbon.

We have made fourteen experiments on this subject, and each of them with all imaginable care: they all agree. These experiments were performed by burning pure carbon, or well known compounds containing a large quantity of it. The combustion was carried on in oxygen, and care was taken to dry perfectly the gases obtained by chloride of calcium and sulphuric acid.

Thus dried, they traversed two absorption apparatus filled with *liquor potassæ*, and a third apparatus full of powdered potassa. The increase of weight of these three apparatus gave the weight of carbonic acid obtained.

Thus we knew the weight of the carbon burned, and that of the carbonic acid obtained, from which might be deduced, without any hypothesis, the proportion in which the bodies combine.

According to M. Berzelius, this proportion is 76·52 carbon.

According to our experiments, it is quite otherwise; for we find—

By the combustion of naphthaline, in four experiments:—

75·21,
75·01,
75·08,
75·07:

By the combustion of camphor, in these experiments:—

75·1,
75·1,
75·0:

By the combustion of benzoic acid, in two experiments:—

75·09,
75·06:

By that of the natural graphite of Ceylon, in three experiments:—

74·91,
75·04,
74·99:

By that of artificial graphite, extracted from iron graphite, in two experiments:—

74·87,
74·90.

All these numbers agree in showing, that the true atomic weight of carbon is 75, and not 76·52. There is, therefore, an error of 2 per cent. in one of the elements most indispensable to the formation of the formulæ at present employed in organic chemistry.

That is to say, that many formula must be modified, and many analyses again made, especially in what concerns bodies which are rich in carbon, where very serious errors may have been committed.

The Academy will observe with interest that this long and tedious series of experiments has brought us to the atomic weight proposed by Dr. Prout, who had long been of opinion that the atomic weight of carbon ought to be exactly equal to six times that of hydrogen. Now, indeed, $12{\cdot}5 \times 6 = 75$,—the mean number of our results.

If, as Dr. Prout thought, and as now appears very probable, all the atomic weights are multiples of that of hydrogen, by entire numbers, there would be many things to be rectified in the atomic weights at present admitted. One ulterior experiment will decide on this point; but, from this time, it must be submitted to strict verification.

The Academy will also observe with interest that the atomic weight of carbon which results from our experiments, agrees much better than the old one with the analyses of the Iceland spar, of arragonite and marble, so carefully made by MM. Thenard and Biot, as well as with the densities of oxygen and carbonic acid determined by MM. Biot and Arago, and M. de Saussure, whose results resemble ours in that which relates to the combustion of carbon.

M. Boussingault has communicated to us some analyses of bitumen, which fully agree with our results.

ON THE PRE-EXISTENCE OF UREA IN URIC ACID.

Professor Gregory read to the Chemical section of the British Association a communication on the above subject. By the action of peroxide of lead on uric acid, Liebig and Wöhler obtained from it oxalic acid, allantoine, and urea, and they considered the latter as existing in the uric acid, combined with *urile*. The author having found that urea, unlike most organic substances, resists the oxidising agency of permanganate of potash, thought, if urea could be obtained from uric acid by the action of that salt, the argument for its pre-existence

* *Académie des Sciences*, sitting of Aug. 17, 1840. From *Comptes Rendus*, No. 7.

would be much strengthened, as, if only the elements of urea were present, the oxidising agency of the permanganate would most likely prevent its formation. On trying the experiment a large quantity of urea was obtained along with oxalic acid, and a new acid, probably formed by the oxidation of allantoine. The author farther described the acetate of urea—a salt which was formed in the experiment.

ON A NEW METHOD OF CRYSTALLOGRAPHIC NOTATION.*

BY MR. J. J. GRIFFIN.

Mr. Griffin classes the planes of crystals into seven elementary sets, which he calls "Forms." The planes of crystallized minerals consist of these forms in various states of combination. Hence a natural crystal, crystallographically speaking, is a "combination." The seven fundamental forms are named P, M, T, MT, PM, PT, PMT. These symbols show the relation of the planes which constitute the forms to what are termed the axes of a crystal. These axes are three mathematical lines which cross one another in the centre of the crystal at an angle of 90°. The position of the first of these axes is perpendicular, whence it is called the principal or perpendicular axis, and is denoted by the sign p^a. The second axis is called the minor or middle axis, and is denoted by the sign m^a. It passes from the front to the back of the crystal. The third axis is the transverse axis. It passes from the left to the right side of the crystal, and is denoted by the sign t^a. All the planes of a crystal, when extended, cut one or two or three of these axes, and they are denoted by letters referring to the axes which they cut. Thus, P means two planes that cut p^a; M, two planes that cut m^a; T, two planes that cut t^a; MT, four planes that cut m^a and t^a; PM, four planes that cut p^a and m^a; PT, four planes that cut p^a and t^a; PMT, eight planes that cut all the three axes. When the axes are cut at different distances from the centre of the crystal, the lengths of the respective axes are indicated by indices placed between the letters which constitute the symbol of the form. Thus, $M\frac{1}{2}T$ denotes a vertical rhombic prism, the diagonals of whose cross section are as the numbers 1 and 2; and $P\frac{2}{3}M\frac{1}{4}T$ denotes a rhombic octahedron, whose three axes have the relation of $p^2_3 m^1_4 t^2_2$. Mr. Griffin entered into various details to prove that the occurrence of planes, not representable by one or other of these seven forms, was a mathematical impossibility, and that the proposed system of notation was amply sufficient for all the purposes of the chemist and mineralogist, while it had over other systems of crystallography the advantage of requiring but a small amount of mathematical knowledge.

* British Association, meeting at Glasgow, Sept. 1840, as given in *The Athenæum*.

NEW METHOD OF ANALYSING SULPHUROUS WATERS.—IODINE AS A TEST FOR HYDRO-SULPHURIC ACID.—SULPHO-HYDROMETER.†

BY M. ALPHONSO DUPASQUIER.

Being occupied in making a complete history of the fine establishment which has lately been founded near the sources of Allevard, (Isere), M. Dupasquier has devoted himself, with peculiar care, to the analysis of the sulphurous water which they so abundantly yield. He has studied it very accurately, and his investigations have led to the discovery of a process, as simple as delicate, for detecting and ascertaining the proportion of hydro-sulphuric acid, free or combined, contained in mineral waters.

Tincture of iodine, poured into a liquor impregnated with hydro-sulphuric acid, completely decomposes that acid, and so instantaneously, that it is very easy to ascertain the point at which its decomposition is finished, and when the iodine no longer enters into combination. Setting out from this observation, which is his own, it occurred to M. Dupasquier that by using a carefully prepared tincture of iodine, he might be able, from the quantity of iodine required for saturating a quart of sulphurous water, to deduce the proportion of free or combined hydro-sulphuric acid which it contained.

This opinion has been confirmed by experiment, and M. D. has rendered his new method of analysis extremely convenient, by means of an instrument which he calls a *sulpho-hydrometer*.

This instrument is a graduated tube filled with tincture of iodine, one extremity of which is closed by a cork, whilst the other is tapered, and terminates in a capillary aperture which allows the tincture of iodine to run out, drop by drop, when the cork is removed.

To use the sulpho-hydrometer, a given quantity of sulphurous water is poured into a porcelain capsule; a few drops of a very clear solution of starch are then added; then the tincture of iodine is gradually dropped into it, taking care to assist the action by stirring. So long as any traces of hydro-sulphuric acid remain, the iodine de-

† *Annales de Chimie et de Physique.*

prives it of hydrogen, precipitating its sulphur, and immediately disappears, without coloring the starch: but from the time that the saturation is complete, the least trace of free iodine is sufficient to communicate to the liquor a fine blue color. The number of degrees that the tincture of iodine is lowered in the sulpho-hydrometer, must then be reckoned: each degree represents 1 centigramme of iodine, and each tenth of a degree, 1 milligramme. The quantity of iodine necessary to saturate a quart of sulphurous water being thus given, it is very easy to ascertain how much hydro-sulphuric acid the water contained, by determining the equivalent of the iodine in the hydrogen, the volume of which being known, we have that of the hydro-sulphuric acid.

To render the use of his instrument more easy, M. Dupasquier has prepared a table, indicating in weight and bulk, the quantity of hydro-sulphuric acid, represented by 1, 2, 3, &c., 100 centigrammes, 1, 2, 3, &c., milligrammes of iodine.

This mode of analysis, independent of giving results of the strictest accuracy, has also the advantage of being so expeditious, that 15 or 20 experiments may be made in less than an hour. It is also so simple, that it is not necessary to be a chemist to determine the proportion of hydro-sulphuric acid contained in a mineral water: any intelligent person may ascertain the variations in the strength of sulphurous waters, caused by atmospheric influences, or by the mixture of rain water. Among other advantages which this method presents, M. Dupasquier holds up to notice its extreme delicacy, which is so great, that it indicates the precise quantities of hydro-sulphuric acid in waters on which other reagents would have no action, although they evidently exhibited a sulphurous character. Tincture of iodine may, indeed, he has ascertained, unequivocally detect one drop of a concentrated solution of an alkaline hydro-sulphate, diluted in a hectolitre of water, whilst known reagents become powerless when it is diluted in 10 quarts.

ON CHEMICAL GEOLOGY.*

BY PROFESSOR JOHNSTON.

Professor Johnston stated the substance of the paper he had given in, on the subject of chemical geology. He confined himself to the consideration of the coal formation. He took it for granted that coal is derived from vegetable substances, and proceeded to consider the character and action of the agents at work in the process of its formation. He discarded the names employed by some geologists to describe the different characters of coal, such as caking, bituminous, &c., and as carbon, hydrogen, and oxygen are the components of all vegetable matter, he proposed to describe the various characters of coal by a chemical mode of notation, indicating the relative proportions of these qualities in coal. Thus, the Newcastle caking coal, and anthracite Welsh coal, were described as follows:—

	Newcastle coal.	Welsh coal.
Carbon . . .	89·19	94·05
Hydrogen . .	5·00	3·38
Oxygen . . .	5·81	2·57
	100·00	100·00

He proceeded to show that it is the peculiar province of chemistry to inquire into the means by which coal is produced from vegetable matter. He then described the process of decomposition which takes place under the united influence of water and atmospheric air. Different kinds of coal, he showed, were not derived from different kinds of wood or vegetable matter; but, in reality, all of them were steps in the descent from highly organised matter to a state, as in the anthracites, where organic structure altogether disappears. Coal was, therefore, derived from vegetable matter, in obedience to a general law. The learned professor, in concluding, referred to the arguments against the opinion that the wood of the coal formation was drifted in water to the places where they were deposited. The evidence on this point, he confessed, inclined him to the belief that the trees had grown on the spot. One argument was this: some of the coal of the Newcastle fields, for instance, was found so pure as to contain not more than one-half per cent. of silt or foreign matter; how, then, could masses of wood be transported to their present beds without a very great mixture of clay or sand? Another argument was, that over a large area the coal was only one inch thick. In other cases there were different kinds of coal overlaying one another in alternate layers, but so different in quality, that the miners could dispose of the whole of one seam as fast as they could work it, whereas the next seam might not be worth disposing of at all. In other cases there was observable a regular stratification. All these arguments were urged by intelligent miners against the theory which assigned the coal formation to drifted trees. Without giving any positive opinion on this point of the subject, he would merely say, that on a weighing of the evidence on both sides, he thought the balance was in favor of the idea that the vegetable matter grew upon the spot.

Dr. Buckland held the views propound-

* *British Association.*

ed by Professor Johnston to amount almost to a demonstration, and regarded them as an epoch in the investigation of the origin of coal. The argument against drifted trees might be true, as far as it went; but it was not true altogether. He believed that other beds of coal were the result of vegetable matter drifted from great distances. Instances of this kind were clearly proved by the pine found in Craigleith quarry, and other fossil trees imbedded in sand, and completely cut off from the ground below. The truth probably lay between extreme views on both sides.

ON THE DECOMPOSITION OF GLASS.*

BY SIR DAVID BREWSTER.

Sir D. Brewster read a very interesting paper upon the decomposition of glass. He had formerly brought the subject before the Association; and since that time he had got two specimens of glass—one from Italy, and the other from St. Andrew's—of which the character had been entirely changed by decomposition. Sir David then described the mode of decomposition. It began at certain points, and extended over the surface, either in planes, or in concentric films, affording colours of surpassing beauty. In one of the specimens, the siliceous portions had separated from the metallic, and had arranged themselves in alternate circles around the first point of decomposition. This liability to decomposition Sir D. feared might produce serious results to science, as some of the finest glasses of scientific instruments were exhibiting symptoms of decay.

Professor Forbes thought the softness of the glass used was more the cause of decomposition than atmospherical influence.

Sir David then described several curious effects produced by the polarisation of light by decomposed glass.

ON THE SOLUBILITY OF SILICA BY STEAM.†

Mr. Julius Jeffreys, late of the Hon. E. I. C. Medical Establishment, communicated a paper to the Royal Society during the past session, giving an account of an experiment on the subjects of which the following is a digest:—

The inner surfaces of a flue built of siliceous bricks, appeared to be deeply eroded by the passage over it of steam at a very high temperature, and fragments of siliceous materials laid in the course of the current, were partially consumed. A siliceous crust was deposited on several vessels of stone-ware, coated with a micaceous glaze, placed in the upper part of the furnace, and this crust was re-dissolved when the vessels were removed to a hotter situation in the same furnace. The author noticed the experiments of Dr. Turner and others, which failed in showing the solubility of silica by steam, in consequence, as he conceives, of the heat not having been sufficiently great to effect the solution.

CHEMICAL ANALYSIS OF ARCHIL AND OF LITMUS.‡

According to the recent investigations of Dr. Kane, read before the Royal Society, he finds in the lichen *Roccella tinctoria* the following bodies either pre-existing in the plant or formed during the process employed for its analysis. 1. Erythroline; 2. Erythrine (the Pseudo-erythrine of Heeren); 3. Erythrine bitter; 4. Telerythrine; and 5. Roceline (the Roccellic acid of Heeren). He finds the *Archil* of commerce to consist essentially of three ingredients, viz. 1. *Orceine*, 2. *Erythroleic* acid, and 3. *Azoerythrine*; of each of the two former there exist two modifications, and there is in addition a yellow matter.

His inquiries into the constitution of ordinary litmus, lead him to the conclusion that that substance contains the principles designated by him as—1. *Erythroline*, 2. *Erythrolitmine*, 3. *Azolitmine*, and 4. *Spaniolitmine*; and that the coloring constituents of litmus are, in their natural condition, red; the blue substances being produced by combination with a base, which bases in that of commerce are lime, potassa, and ammonia, and there is mixed up in the mass a considerable quantity of chalk and sand.

NEW WORKS ON CHEMISTRY.

Instructions for the Multiplication of Works of Art in Metal, by Voltaic Electricity. With an Introductory Chapter on Electro-Chemical Decompositions by Feeble Currents. By THOMAS SPENCER. Glasgow: R. Griffin and Co.; and Tegg, London.

This work, which forms No. IV. of Griffin's Scientific Miscellany, is one of the highest importance. The art of Electrography, as Mr. Spencer terms it, has, owing more especially to his own labors and discoveries, made rapid strides towards per-

* *British Association.*

† *Proceedings of the Royal Society*, 1839-40.

‡ *Proceedings of the Royal Society*, 1840.

fection. With the assistance of his ingenuity and industry, together with that of the endeavours of other and very eminent scientific men who are now investigating this subject, we are of opinion that this very beautiful art will, ere long, be rendered of the most general practical utility. We heartily wish these gentlemen success in their endeavours.

The work before us is a very able and comprehensive detail of the various Electrographical processes: the introductory chapter on electro-chemical decompositions by feeble currents, alone is sufficient evidence of the author's knowledge of the subject.

We may conclude this notice by recommending this work to the careful perusal of our readers, and by giving the following extract from the Preface:—

"When we take into view the fact that every form of matter we are acquainted with is saturated in definite proportions with this wonderful power, lying, as it were, dormant, but never under any circumstances refusing to be drawn forth to perform its functions, when the proper means are applied; and when we recollect that it can never be dissipated,—the force, it is true, may be misapplied by ignorance, but not wasted,—that it fulfils its assigned office during its passage from one body to another, from whence it may be again and again recalled with definite, yet undiminished vigour. When we also take into consideration that scientific men, in every quarter of the globe, are at this moment running a race with each other, vieing who shall be the first to make another useful application of this principle; and that the battery is rapidly becoming a tool in the workshop, and an instrument in the surgery;—with these facts before us, surely little doubt can be entertained that we are on the threshold of still greater improvement.

"It might be expected that this work should have been illustrated by the process it describes. Under other circumstances it would have been so: electricity is now capable of performing tasks of greater difficulty; but, in the present instance, it would have rested with myself to have done it, the manipulation of the process not being sufficiently known to the engraver, although rapidly becoming so, and my own spare time has been occupied with subjects which I have deemed of more importance than the drudgery of repeating experiments, with the results of which I was already acquainted. Within the last year I have sent specimens to the public, exhibiting its capabilities in every ordinary department of art; and a repetition of this from me is surely uncalled for, my object being fully attained when the best and most expeditious method has been pointed out.

"Latterly, I have seen voltaic copies of large engraved copper plates, exhibiting the most minute and microscopic lines, with all the fidelity of the originals; even the burnished appearance of the surface, which, under other circumstances, they never could have acquired, but from the peculiar friction given to them by the hand of the workman. These may be multiplied *ad infinitum*.

"There are few branches of manufactures in any way connected with art, that will not benefit by the adoption of this principle. Already it is in active operation among calico printers. Potters can now afford to pay for the highest art to design and engrave one plate, as they may have any number of duplicates equal to the original, at little more expense than the price of the copper. The copper matrix for type founding, however elaborate, may now be produced with the greatest facility, and at a trifling expense.

"Wood engravings may now be copied in copper to any extent, and the finer lines which could not be obtained in the originals, may be put into the copper fac-similes with facility. Even in stereotyping, it may ultimately be found as economical as the method in common use, and certainly much better.

"Elegant designs are deposited on plates in relief, from which embossed cards are printed; in short, there is scarcely a department connected with the elegancies and refinements of life, where I do not hear of its application; but since I discovered an efficient method of metallizing the surface of non-metallic substances, a copper statue may be taken from a plaster of paris mould, in little more time than would be required to deposit the same thickness on a metal.

"Few who watch the progress of events can doubt, that had this discovery not been made at the present period, a very brief additional time would have brought it under public attention. Scientific facts were all tending toward it. The great discoveries of the last age were being condensed and combined into the elements of learning for this. Trains of scientific thought which had been long and curiously laid, only required the aid of the match to explode them simultaneously.

"In this little work I have laid the experience I possess on this branch of scientific art before the public, but doubt not that a few years in the hands of the many will improve it. It is true I have been a long time occupied with the subject, but it must be taken into consideration, that my means of cultivating science are limited, the hours it occupies being stolen from those usually set apart for relaxation and rest, my ordinary avocations being of a laborious nature; yet I have felt so much gratification in the pursuit, so much exquisite pleasure at the

results of successful experiment, that I consider my own reward as ample."

Descriptive Account of some New Instruments, and of some Eudiometric Apparatus, recently invented. By CHARLES THORNTON COATHUPE, Esq. of Wraxall, near Bristol.—London: Ball, Arnold & Co.—Bristol: Philp and Evans.

This work is dedicated "To All Lovers of Scientific Investigation," and is well worth their attention. The new instruments are for correctly graduating glass tubes for Eudiometrical and other purposes, and are well illustrated by very neatly executed plates with copious references. We are of opinion that these instruments will be found far more accurate than any at present in use.

The Eudiometric Apparatus consists of a New Eudiometer, and a tube for estimating the quantity of carbonic acid gas in deteriorated atmospheres, invented by Mr. Coathupe. They are very useful instruments, and very simple in their construction and mode of use.

We regret being unable to give an extract from this work: we feel that nothing we may say can give a just idea of the merits of the instruments described in it, and we therefore recommend it to our readers: they will be best able to judge for themselves.

II. CHEMICAL MANUFACTURES.

ON THE MOST IMPORTANT CHEMICAL MANUFACTURES CARRIED ON IN GLASGOW AND ITS NEIGHBOURHOOD.*

BY PROF. THOMAS THOMSON, OF GLASGOW.

Glasgow being the seat of a great many interesting and important chemical manufactures, it occurred to Professor Thomson, that it might be of advantage to those members of the Chemical Section, who came from a distance, to give a short catalogue of the most important of these manufactures, that they might know what the information is which they may expect, and where they are to seek it.

I. IRON.

The smelting of iron has been carried on in the neighbourhood of Glasgow, for above fifty years. The late Mr. Dunlop, of the Clyde Iron Works, informed me, that when he first became proprietor of those works, the produce was but fourteen tons a-week, or 728 tons a-year; and at that time, I rather think, there were no other works in the neighbourhood. At present the quantity of iron smelted in Glasgow and the neighbourhood cannot be much less than 200,000 tons or nearly a fifth part of the whole iron smelted in Great Britain. Mr. Dixon has extensive iron works in the suburbs, on the south side of the river, and the Clyde Iron Works are situated on the banks of the river, and about four miles to the east; but the great seat of the iron works is the neighbourhood of Airdrie, or rather Coltsbridge, about nine miles east from Glasgow, but connected with the city by the Monkland canal and the Garnkirk railroad. The ore from which the iron is smelted, is the carbonate of iron, or clay iron-stone, as it is usually called by mineralogists. This ore is very abundant all round Glasgow, and especially in the neighbourhood of Airdrie. Fortunately for the smelters, the iron-stone and coal beds are associated together, the iron-stone either occurring in boulders or beds along with the coal.

The rapid increase of iron smelting has been the consequence of a discovery made by Mr. Neilson, manager of the gas works. This is now universally known under the name of the hot blast. The air is heated to more than 607° before it enters the furnace, by passing through a range of heated pipes. Under this treatment, it is found, that the coals may be used without previous coking; and that instead of seven tons of coals for every ton of cast iron, three tons or even two tons and a half will be sufficient. There is also a diminution in the quantity of limestone necessary, and the produce of iron per week from the same furnace is considerably increased. It is said, that neither in Staffordshire, nor in Wales, is the hot blast attended with the same saving of fuel. Till of late years, no bar iron was made in Scotland, the smelters confining themselves to cast iron. About three years ago, Mr. Dixon commenced the manufacture of bar iron near St. Rollox, but, after some time, he abandoned the manufactory. It is now conducted on a great scale by Mr. Wilson, at Dundyvon, and by Mr. Dixon, at Glasgow, and perhaps by other iron-masters. The heat raised in the puddling furnace is much greater than it was in Staffordshire, when I witnessed the process there about twenty-five years ago.

* *British Association.*

At Holytown, not far from Airdrie, there is an interesting manufactory of steel, where melting and casting steel may be seen: the heat necessary for this process is greater than for any other. It is curious, that the clay in the neighbourhood perfectly answers for making crucibles for cast steel; but it does not answer so well as Stourbridge clay, for making glasshouse pots. On analyzing the two clays, we found that the Garnkirk contained much more alumina and less silica, than the Stourbridge; showing that glass in fusion acts more powerfully on alumina than on silica.

II. Sulphuric Acid.

Another manufacture of importance, and which is indebted to Glasgow for the state of perfection which it has reached, is that of *sulphuric acid*. It was begun by Dr. Roebuck, at Prestonpans, about the year 1763, but it is not more than twenty years since his manufactory was abandoned. The sulphuric acid works, at St. Rollox, on the banks of the Monkland canal, were begun about forty-five years ago. They were at first upon a very small scale, though now probably are the largest of the kind in Europe. Dr. Roebuck's method was to mix together sulphur and saltpetre, and after setting the mixture on fire, to introduce it into a leaden vessel or chamber, at the bottom of which there was a quantity of water. This method was not economical. A portion of the sulphur would unite with the potassa of the saltpetre, and form with it a sulphuret, and probably a portion of the sulphuric acid formed, would also unite to the potassa and form a sulphate.

When Messrs. Knox, Tennent, and Macintosh established their works at St. Rollox, they separated the sulphur from the saltpetre; the sulphur was burnt over a stove; and an iron cup containing the requisite quantity of saltpetre, mixed with the requisite quantity of sulphuric acid, was placed over the burning sulphur. By this contrivance the sulphur was completely converted into sulphurous acid, and the whole of the nitric acid carried along with it into the leaden chambers. The size of the leaden chambers was gradually increased, and the substitution of steam for the water formerly placed at the bottom of the chambers, was a great improvement. The acid which collects at the bottom of the chambers has now a specific gravity of 1·75, or it is a compound of one atom anhydrous acid, and two atoms water. This acid is concentrated by heating it in a platinum still, till the second atom of water is driven off. When this manufacture is at full work, the quantity of sulphuric acid made in it exceeds 300,000 lbs. avoirdupois per week. When I first began to purchase sulphuric acid, about forty-five years ago, it cost 8*d*. per pound; the price is now under a penny a pound.

III. Bleaching Powder.

One of the great purposes to which sulphuric acid is applied at St. Rollox is, the manufacture of *bleaching powder, or chlorite of lime*, as it is now called. When the mode of bleaching by chlorine was introduced into Great Britain, by Mr. Watt, in 1787, the very offensive smell and deleterious effects of that gas upon the workmen, was a formidable objection to its use. Various methods were tried to remove this objection. It was found, that if potash or soda was dissolved in the water before it was impregnated with the chlorine gas, the disagreeable smell was destroyed; but, unfortunately, this addition destroyed at the same time the bleaching power of the gas. Messrs. Knox, Tennent, and Macintosh at last discovered, that if lime were mixed with the water before it was mixed with the gas, the disagreeable smell was done away with, and the bleaching power still remained uninjured. They took out a patent for this discovery; but it was infringed upon by the Lancashire bleachers, a lawsuit was the consequence, and the patent was destroyed. It was then that Mr. Macintosh tried, whether chlorine would not be absorbed by slacked lime. The trial succeeded: a compound was formed, which readily dissolved in water, and the solution of which possessed great bleaching power; a patent was taken out for the manufacture of this dry powder, which the patentees distinguished by the name of bleaching powder. This patent was not infringed; the sale of it was at first small, and it was overlooked by the bleachers. The consequence was, that the patentees had leisure to perfect their method of preparing it, and to become able to sell it at so low a price, that it gradually superseded all the old methods of bleaching by chlorine.

The process may be seen at St. Rollox in great perfection, and on a very large scale.

The requisite mixture of common salt, binoxide of manganese and sulphuric acid, is put into a leaden still, and the chlorine evolved passes through leaden tubes into air-tight stone chambers, the bottoms of which are covered with a stratum of slacked lime several inches thick. The lime absorbs the gas as it passes into the chamber, and the process is continued till the absorption is reckoned sufficient. Bleaching powder, supposing it pure, is a compound of

1. Chloride of calcium . .	7
2. Chlorite of lime	10
3. Water	3·375
	20·375

Half the lime loses its oxygen, and combines with chlorine, constituting chloride of calcium. The oxygen combines with chlorine, which, in the state of chlorous acid, combines with the other half of the lime, constituting chlorite of lime. Two atoms of the water were in the slacked lime. The third atom must have come along with the chlorine gas, or been absorbed from the atmosphere.

IV. Soda.

After the chlorine has been extricated, there remains in the still a semi-liquid mass, consisting partly of the impurities of the manganese, and partly of sulphate of soda and sulphate of manganese. If the manganese were pure binoxide, and only the quantity of salt and sulphuric acid necessary for the decomposition were used, the sulphate of manganese (abstracting the water) would weigh nine and a half, and the sulphate of soda, nine. But in order to save the stills by producing the decomposition with little heat, twice as much sulphuric acid is used as is necessary, and this excess is afterwards saturated by means of common salt; so that the quantity of sulphate of soda in the residue is at least twice as great as that of the sulphate of manganese.

To get rid of the sulphate of manganese, the residue from the stills is fused in a reverberatory furnace at a red heat; this drives off the sulphuric acid, and leaves the manganese in the state of sesquioxide. The whole is dissolved, and the insoluble manganese thrown away. The solution of sulphate of soda is evaporated to dryness, mixed with small coal, and fused again. This destroys the sulphuric acid, and converts the soda into sulphuret. This sulphuret of soda being mixed with saw-dust, &c., and exposed to an incipient red heat, the sulphur is driven off, and carbonate of soda remains, which is obtained in crystals by solution and crystallization, or in the state of *soda ash*, by a more rapid process.

The theory of the last step of the process, in converting the sulphate of soda into carbonate, is not very obvious, and would require an experimental investigation to throw light on it. But my object at present is not to theorize, but to state facts.

V. Alum.

Another chemical manufacture, which may be seen, is *alum making*. There are two establishments, one at the Hurlet, about six miles south-west, by the Paisley canal; another at Campsie, about eight miles off, near Kirkintulloch, on the Great Canal, and near the foot of the Campsie Hills. The alum is made from the *shale*, which exists in great abundance in the exhausted coal beds. This shale is a clay mixed with some coal, and with that variety of iron pyrites, which undergoes decomposition, and is converted into sulphate of iron by exposure to the air. The sulphate of iron, thus formed, slowly acts on the clay, and in process of time converts it into sulphate of alumina. The alum maker washes this altered shale, and obtains a solution of sulphate of iron and sulphate of alumina. When sufficiently concentrated and cooled, the liquor yields an abundant crop of sulphate of iron, which is removed, dried, and sold at a cheap rate. The sulphate of alumina does not crystallize till it is mixed with sulphate of potassa or sulphate of ammonia; because alum is a double salt, composed of three atoms of sulphate of alumina and one atom of sulphate of potassa, or sulphate of ammonia.

Formerly nothing but chloride of potassium, bought from the soap-makers, was used. But of late years (at least at Hurlet) sulphate of ammonia, from the liquor obtained during the preparation of gas, has been employed. In general, the alum made at Hurlet contains both potassa and ammonia; but the manufacturer can supply it free from potassa. Such alum is convenient to chemists, because when it is heated to redness everything is driven off except pure alumina. At Hurlet and at Campsie, the mode of concentrating the liquid by a current of heated air passing over its surface, deserves attention.

VI. Prussiate of Potassa.

At Campsie alum works another interesting chemical manufacture may be seen, the fabrication of prussiate of potassa, a beautiful well known yellow salt, which crystallises in truncated octahedra. It was here that the manufacture of this salt, on a great scale, first began. Before that time it was only prepared in laboratories for scientific purposes, and sold at a high price. Mr. Mackintosh introduced it to the calico-printers, who use it extensively, to produce very beautiful blues and greens. It is prepared by burning the hoofs and horns of cattle in iron pots, along with a quantity of potassa. The hoofs and horns of a hundred head of cattle are consumed every day in the works. For some time no iron was added, the requisite quantity for forming the salt being corroded from the pots during the combustion. But the last time that I visited the works, I found that iron was mixed with the hoofs, &c. during the combustion. The residue after this combustion is lixiviated with water, and when the solution is sufficiently concentrated, the prussiate of potassa crystallizes.

Connected with this manufactory of prussiate of potassa, is another of Prussian blue.

It is made by mixing sulphate of iron, alum, and prussiate of potassa, and precipitating the whole by an alkali. The precipitate is at first light blue. But it is washed with new portions of water every day, for several weeks. At every washing the colour deepens, and when it has acquired the requisite shade, the Prussian blue is allowed to subside, the water is drawn off, and the powder allowed to dry. The colour varies according to the proportion of alum employed, and it has the finest colour of all, with the coppery lustre which is so much admired, when no alumina whatever is mixed in it.

VII. Bichromate of Potassa, &c.

Another beautiful chemical product may be seen at Shawfield, near Rutherglen, about two miles from Glasgow, in the manufactory of Mr. White—I mean *bichromate of potassa*, a salt very much used by calico-printers, and forming the finest and most indelible yellows, oranges, and greens. Its introduction constituted quite an era in calico-printing. This salt was originally made by heating chromic iron ore with saltpetre, dissolving out the chromate of potassa, and adding the requisite quantity of nitric acid to deprive the chromic acid of half its potassa. When this process began, the salt was sold at a guinea an ounce. But now, when the price is as low as two shillings a pound, it is necessary to prepare it by a cheaper method. It has been found that common potassa of commerce may be substituted for saltpetre; and I believe the manufacturers now contrive to form the bichromate at once, without requiring the use of an acid, which would nearly double the expense. I believe all the bichromate used by the calico-printers is made here and in Liverpool. In the same manufactory may be seen a beautiful product;—I mean tartaric acid, which is used by the calico-printers to a large amount, chiefly for disengaging the chlorous acid from bleaching powder, and enable it to destroy the colour on particular parts of the cloth, either that these parts may remain white, or that some other colour may be superadded. Tartaric acid is obtained from cream of tartar, by throwing down the tartaric acid by means of lime, and afterwards decomposing the tartrate of lime by means of sulphuric acid, and crystallizing the tartaric. At the same manufactory may be seen a pretty and simple process, by which the carbonate of soda is converted into the sesquicarbonate. By simply exposing it dry and in powder, in an atmosphere of carbonic acid gas, it absorbs the requisite quantity to be converted into sesquicarbonate. And this sesquicarbonate is chiefly used by the makers of soda water.

VIII. Acetic Acid.

It is hardly proper to mention the manufactory of acetic acid from wood, which has been carried on for many years by Mr. Turnbull, because the first part of the process is, I believe, carried on at a distance, for the sake of the wood—I mean, the distillation of the wood. To free the acetic acid from the tar, which destroys its flavour and taste, the acid was combined with lime, and the acetate of lime thus formed is exposed to a heat sufficiently high to char the foreign bodies with which it is impregnated, the acetic acid being capable of resisting a higher temperature without decomposition than most compound vegetable bodies. The acetate of lime, thus free from impurities, is decomposed by sulphuric acid, and the acetic acid obtained by distillation. By this process it may be obtained very strong. I have it composed of one atom acetic acid, and one atom water. When of this strength, it crystallizes in winter, but becomes liquid again in summer. In the same manufactory there is another liquid prepared, namely, *pyroxylic spirit*, now well known.

A most interesting set of experiments on it has been made by Dumas, who has distinguished its basis by the name of *methylene*, and has discovered many new compounds which it is capable of forming.

IX. Iodine.

Another chemical manufacture of considerable importance, and which I believe to be peculiar to Glasgow, is *iodine*.

A few years ago, there were no fewer than ten manufactories, in each of which it was made to considerable extent; but as iodine is only used in medicine, the sale is limited, and I believe that most of these works are now abandoned. The process followed by all the makers was, I believe, that contrived by Mr. Mackintosh. Iodine is obtained from kelp, and it deserves attention, that those kinds of kelp which contain most potassa contain, at the same time, the most iodine. The kelp is lixiviated, and all the salts that can be extracted from the solution by evaporation are separated. The supernatant liquor remaining is mixed with an excess of sulphuric acid. A great quantity of sulphuretted hydrogen is evolved, the bad effects of which on the workmen are prevented by setting it on fire, and allowing it to burn as it is extracted from the liquid. To the liquid thus freed from sulphuretted hydrogen and from muriatic acid, a quantity of binoxide of manganese, equal in weight to the sulphuric acid employed, is added. The whole is put into a leaden still, and heated to a temperature which must not exceed 190° or 200° at most. The iodine passes into the receiver, which

consists of a series of spherical glasses, having two mouths opposite to each other, and inserted the one into the other.

X. Soap.

It may seem superfluous to mention *soap*, because it is a manufacture universally known: but soap of a very superior quality is made in Glasgow. The number of soap works amounts to seven, and one of these, that at St. Rollox, is the third, if not the second, in point of extent, in Great Britain.

The ingredients of soap are soda, tallow, and rosin, and sometimes palm oil. Only two kinds of hard soap are made here, namely, *yellow* and *white*. The yellow soap is made by boiling 9·75 cwt. of tallow, 3·25 cwt. of rosin, 4 cwt. of soda ash, equivalent to 2 cwt. soda, mixed with the requisite quantity of water. The white by boiling 13 cwt. of tallow, 4 cwt. of soda ash in the same manner.

Tallow, which is a compound of two oily acids and glycerine, undergoes decomposition, and the soda combines with the acids, and forms soap. When the combination is complete, a quantity of common salt is put into the hot liquor. It dissolves in the water, and the soap separates, and swims on the top. It is now allowed to cool to 150° at an average, and is then taken out in a liquid state, and poured into frames, where it is allowed to become solid, and then cut into the usual parallelopipeds, or wedges, as they are called. It is customary, during the *cleansing* of the soap, as the pouring it into the frame is called, to mix it with a quantity of caustic soda ley. The soap made in Glasgow is usually a compound of—

1 atom oily acid .. 53	or per cent.	74·6
2 atoms soda 8	,,	11·2
9 atoms water .. 10·125	,,	14·2
71·125		

White soap is cleansed at the average temperature of 181°. Its constitution is precisely the same as that of yellow soap.

XI. Bleaching of Cotton.

Bleaching of cotton cloth is carried on here to a great extent. It consists of four processes:—1st, The goods are boiled with lime, at a temperature above the boiling point of water. The process is curious, and deserves to be seen. 2nd, The cloth is steeped in a solution of bleaching powder. 3rd, It is boiled with caustic soda or potash. 4th, It is steeped in water acidulated with sulphuric acid.

XII. Turkey Red Dyeing.

Turkey red dyeing has been practised here for nearly half a century.

XIII. Calico Printing, &c., &c., &c.

I need hardly mention *calico printing*, which is carried on here to a great extent; *glass-making*, which is carried on here or on the Clyde in all its branches; *starch-making*, of which there is only one manufactory. The manufacture of the dye stuff called cudbear, employed in dyeing red, has long been carried on here; so has the distillation of spirits, and the manufacture of ether.

ON THE MANUFACTURE AND ADULTERATION OF GIN.

BY CHARLES WATT.

Among the various articles of general consumption, there are none which undergo more extensive and dangerous adulteration than gin.

As our readers are not, perhaps, acquainted with the mode in which this peculiar compound is manufactured, it may not be digressing too far, to give them a brief account of its production, and then to shew the materials and manner of adulteration.

By the excise laws of this country, the malt distiller, and the "rectifier and compounder," are not allowed to carry on their respective businesses within a certain distance of each other, in order to prevent an illicit intercourse and co-operation between them. The malt distiller first forms the spirit by making a wort — as it is termed— of equal parts of malt and barley, ground and mixed with a certain quantity in a mash-tun. When left to digest for some days, the wort is drawn off into the fermenting tun, and so soon as it is reduced to the temperature of about 70°, a quantity of brewers' yeast is added, and after well stirring the mixture, the fermentation commences, and continues until all the saccharine matter is converted into spirit, which is known by the cessation of fermentation: it is now called a wash.* This is then removed into the still, and the spirit is brought over; when this is done, it is sent to the rectifier and compounder, who, with a mixture of a certain quantity of coriander seeds and bruised juniper berries, puts it into the still, and allows the spirit to run off until it has attained a certain point of strength, which is indicated by the hydrometer.

In this state it comes into the hands of the dealer, who, if carrying on his business respectably, merely flavors it and adds a certain quantity of water,—which it is im-

* This occupies two or three days.

possible to detect by the hydrometer, in consequence of the addition of sugar,—and sells it at a corresponding rate.

The flavoring mixture is composed of sugar, spirit of turpentine, powdered angelica root, and elder-flower water; a little essential oil of lemon is also added. This constitutes the common gin as sold at houses of good repute.

In houses where it is sold in an adulterated state, it is first very largely diluted with water; then it is mixed with capsicums, sulphate of zinc, &c., and an extra quantity of turpentine to make it produce on the palate an artificial sensation of heat; and we understand even ligneous naphtha and other powerful agents are sometimes used, in order to give to the palate the sensation of ardent spirit. Such practices require the vigilant attention of the Excise, and a careful examination of the suspected liquor. The means of detecting vegetable stimuli, such as those in capsicum and bird pepper, are first to evaporate all the alcohol; if the residual liquid contain them, it will give the powerful sensation peculiar to these substances, when applied to the tongue. In this state it is consumed by those who are not able to control their propensity to so deadly a vice as drunkenness.

From the foregoing statement it will be seen that we have in this spirit a compound of alcohol with the most powerful and injurious substances. It may, we will admit, be urged that the smallness of the quantities of the more noxious ingredients is such as to have a very trifling effect. Feasible as this may appear when abstractedly considered, we have good reason to believe that such compounds, when so often taken internally, are highly injurious to the digestive organs; indeed, if homœopathy has any foundation, the smallest divisions produce, by continued action, the most powerful effects. Be this as it may, we can have no doubt of their bad effects when perpetually introduced into the system. Let us but for a moment reflect on the injury to those important organs through which they pass: every action in these organs must be affected, and their functions become deranged, until at length permanent disease supervenes. We are convinced that no part of this compound is so injurious as the ardent spirit it contains. Who has not witnessed its devastating influence on "mind, body, and estate?"—The premature old age—the disease of the liver and other vital organs—the palsied hand—the *delirium tremens*—paralysis, imbecility and insanity—the vice, profligacy and crime—the abject poverty, filth, and neglect of home, family and business—present appalling and melancholy evidence of the loathsome sad practice of drinking, and afford an irrefutable proof of its sad results. Yet as we see the victims of this horrid vice holding in detestation and enmity those honourable individuals, who, with the deepest solicitude for the welfare of their poorer neighbours, sacrifice much time and incur much trouble, with the sole intent and hope of redeeming them and their families from destruction, and under the deepest conviction of the truth of the memorable language of the Greek poet.*

Earnestly do we recommend those who are the victims of this sad propensity, seriously to reflect on the results which attach to it, and the injury done to their health and circumstances, by the fraudulent practices of which they are made the dupes, to satisfy the rapacious cupidity of the keepers of those vile dens of abomination—gin palaces.

NEW STONES.—IMPORTANCE ATTACHED TO THE SELECTION OF A STONE FOR BUILDING PURPOSES.

We have been favoured by Mr. Robert Adams, of the Old Barge House, with two specimens of stone: one from Otley Chevin in Yorkshire; and the other from Talacre, North Wales. The stone from Otley Chevin is certainly of a very superior description, and eminently adapted for the construction of public buildings, and for resisting the ravages of time. A piece of this stone was examined comparatively with a piece of Portland stone, and another of Scotch granite: they were subjected to the action of steam for six hours. When taken out it was found that they had absorbed as follows:—

Otley Chevin . . .	1½ per cent.
Scotch Granite . . .	3½ ,,
Portland	5 ,,

The Otley was the only one that remained in a fit state to be sawed: the Portland went to dust with the slightest touch; the Granite crumbled into small pieces.

The Talacre stone is the next that comes under our notice, and well worthy is it of attention. This stone is as superior for its fine appearance as for its extraordinary durability and compactness of structure. We examined this stone comparatively with that of Balsover Moor: the following is the mode in which we operated, and the results:—We took two pieces of each stone,—each weighing 1000 grains: we steeped them in water for 48 hours: after being removed from the water and being allowed to stand a few minutes that the water on the surface might

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* Pindar.

drain off, these two pieces of stone were weighed: the Balsover was found to weigh 1053 grains, having absorbed 53 grains of water; the Talacre weighed 1031 grains, having absorbed but 31 grains. Thus the absorbent power of these two stones is nearly in the ratio of three to five. This difference is owing to the greater "porosity," as it is termed, of the Balsover Moor stone.

Porosity is one of the worst defects a stone can possess: it facilitates vegetation, by giving room for the roots to fix themselves, and by admitting so much water. But its porosity is attended with another and more direct evil: from the readiness with which it, structure admits water, in summer weather, heavy showers coming on will saturate it, and soon after, perhaps, the sun appears, shining with great power; the heat of the sun warms the water in the stone, and causes the latter to expand: the consequence of which is that the stone scales, as it is technically termed.

Mr. Jenkins, in a paper on this stone, read to the Institution of British Architects, gives the following description of the Talacre stone:—

"The mineralogical character of this stone is that of siliceous sandstone, with an argillo-siliceous cement. It is of great density, a cubic foot weighing 150¼ lbs.—is worked with great ease, and being remarkably free from hard untractable veins and soft places, is capable of a very smooth surface,—a fine arris and the most delicate carving. The closeness of its texture and fineness of its grain render it very desirable for external work in a large city, as it prevents the soot from adhering to it, and thus clogging up the mouldings and carvings, reducing them to an undistinguishable mass of blackness,—a fault justly complained of in the Bath and Portland stones."

It may not be irrelevant to mention that the shrine of St. Winifred's well, at Holywell in Flintshire, erected in the fifteenth century, is built of this stone; and we can bear witness to the high state of preservation in which this beautiful little building remains, although surrounded by humidity. The circumstance of its being erected over the well, from which humid vapors rise every night, is sufficient to have destroyed any other stone. We may also mention an ancient mansion in the village of Llanasa, constructed in 1642, and Rhyddlan and Denbigh Castles, built towards the end of the thirteenth century. Among recent edifices, Talacre Hall, the delightful seat of Sir Edward Mostyn, Bart. is a very beautiful specimen of a building erected with this stone. We recollect being much struck with its very elegant appearance.

Mr. Adams, who is bringing these stones into notice, deserves much praise for the good he is effecting: he has had upwards of thirty years' experience in the selection of stone.

It has been our object by the foregoing observations to show the necessity and importance of selecting a durable stone for building purposes, and we shall be happy, if by our instrumentality some little good may be effected. The state of some of our more recent public buildings is such as to demand greater care for the future in the selection of stone.

PATENT GRANTED TO MR. MOSES POOLE, FOR IMPROVEMENTS IN THE MANUFACTURE OF CAUSTIC SODA AND CARBONATE OF SODA.

ABSTRACT OF SPECIFICATION.

The patentee gives the following description of his process: we adopt nearly his own words:—

"The nature of the invention consists in the following system or cyclus of operations, by which these products are procured from common salt:—

"I first prepare sulphate of soda, by the double decomposition of chloride of sodium (common salt), and sulphate of ammonia, by which decomposition, sulphate of soda and hydrochlorate of ammonia are produced. The sulphate of soda is then converted into sulphuret of sodium, by heating it with charcoal, or any other carbonaceous substance, and this sulphuret of sodium is decomposed by protoxide of copper, by which decomposition caustic soda is formed, which, if required, may be evaporated to solid caustic soda; or it may be saturated with carbonic acid, and thus converted into carbonate of soda.

"The sulphuret of copper resulting from the decomposition of sulphuret of sodium and protoxide of copper, is then calcined in a current of atmospheric air, by which operation deutoxide of copper is formed; the sulphur being burned and volatilized in the state of sulphurous acid gas. I then combine this acid with caustic ammonia, gained by the decomposition of the muriate of ammonia, by means of lime, exposing the sulphate of ammonia thus obtained to the action of atmospheric air, and regain sulphate of ammonia, which is then again used for decomposing common salt.

"Lastly, the deutoxide of copper is converted into protoxide by moderate heating, with a certain quantity of coal. The same cyclus of operations may then be recommended; the ammonia as well as the protoxide of copper, and the greater part of the sulphur being recovered.

"I shall now give a more detailed descrip-

tion of this process or processes, which I divide in the following seven parts.

"First part.—As the conversion of common salt into the state of sulphate of soda, by its mutual decomposition with sulphate of ammonia, is a well known process, a description of it would be superfluous. The muriate of ammonia thus obtained is afterwards used for restoring sulphate of ammonia, as will hereafter be described.

Second part.—The decomposition of sulphate of soda by heating it with coal, charcoal, turf-coal, coke, or any other sort of carbon, is also a well known process: but I recommend that this decomposition be effected in a closed vessel, in order to prevent the loss of a large quantity of sulphur which, otherwise, would be burned and thus volatilized.

Third part.—The sulphuret of sodium, produced in the latter operation, is then dissolved in water and filtered, in order to separate the remaining coal (which may be employed in subsequent operations), and protoxide of copper in the state of a fine powder is added to the liquid, slowly and in little portions, and by well stirring the matter until the decomposition of the sulphuret of sodium is found to be completely effected, by adding to a small portion of it a few drops of a solution of sulphate of copper, which, if the decomposition is not finished, will produce a precipitate of a blackish colour; but if, on the contrary, the decomposition of the sulphuret of sodium is complete, it will give a precipitate of a pure blue colour. The sulphuret of copper is then separated from the liquid containing caustic soda, by filtering, or in any other convenient manner.

Fourth part.—If solid caustic soda be required, the solution of caustic soda may then be evaporated to dryness. If carbonate of soda be wanted, the solution of caustic soda is saturated with carbonic acid. Although any manner of putting caustic soda in contact with carbonic acid may be adopted, I prefer making use of a large vessel or chamber, constructed of bricks, and covered on the inside with Roman cement or any other convenient substance filled up with pieces of granite, limestone, or any other sort of stone, except such sorts of stone as might be considerably attacked by the caustic liquid. I suffer the liquid to flow gently over the stones, and at the same time I introduce a current of carbonic acid produced by the combustion of coal, coke, charcoal, or any other suitable combustible at the inferior end of the chamber. The carbonic acid, passing through the interstices of the stones will be absorbed by the caustic soda, and carbonate of soda will be formed, which may hereafter be evaporated and calcined in the usual way.

Fifth part.—The sulphuret of copper, gained as described in the third part of this specification, is now to be converted into deutoxide of copper by calcining it in such a manner as to allow the sulphurous acid gas produced by this calcination to be received in the apparatus destined for the preparation of sulphate of ammonia. I effect this calcination in an iron muffle, heated to a feeble redness, and I cause a slow current of atmospheric air to pass through the muffle, and then into the apparatus, which will be described in the next part of this specification. The sulphuret of copper which may form a bed of about one inch in the muffle, is to be well stirred until the smell of sulphurous acid ceases. The deutoxide of copper is then taken out of the muffle, and a fresh quantity of sulphuret is introduced in such a way that the muffle may be kept continually heated. It is now to be remarked that the deutoxide of copper brought into contact with the proto-sulphuret of sodium would decompose this latter so as to form a considerable quantity of hyposulphate of soda mixed with caustic soda. It is in order to prevent this hyposulphate of soda from being produced, that I employ the protoxide of copper which is obtained by mixing the deutoxide of copper with about $\frac{1}{20}$ of its weight of powdered charcoal or turf coal, and by heating this mixture in a well closed vessel of iron or any other suitable material to a feeble degree of redness.

Sixth part.—I have already observed that the sulphurous acid gas, produced by the calcination of sulphuret of copper, is to be received into any suitable apparatus, in order to be saturated with ammonia. I get this ammonia by distilling the muriate of ammonia procured, as described in the first part of this specification, with caustic lime. In order to combine this ammonia with the sulphurous acid, I use a large vessel or chamber, constructed of lead or any other suitable material, filled with fir chippings. By means of a ventilating apparatus, I cause a moderate current of atmospheric air to pass over the glowing sulphuret of copper in the muffle, as is above described; and after being sufficiently cooled by passing through a pipe surrounded by cold water, to move slowly through the interstices of the chipping. At the same time, the caustic ammonia is introduced on the upper end of the chamber, and gliding slowly over the chipping, it absorbs the sulphurous acid, and is thus converted into the state of sulphite of ammonia. In order to prevent any loss of ammonia that might be caused by the current of the air leaving the chamber, I employ a second chamber; or if it should be found convenient, several chambers of the same construction as the

first, and also filled with chipping, through which the current of air is forced to pass, and over the chipping of which a very weak solution of sulphuric acid in water is caused to flow. By this means the ammonia, carried off by the air leaving the first chamber, is entirely absorbed, and thus saved, sulphate of ammonia being formed, which may be added to the solution of sulphate of ammonia, the preparation of which forms the last part of the process.

SEVENTH PART.—This process consists in the oxidation of the sulphate of ammonia to sulphate, and is very easily performed by exposing a solution of the former salt to the contact of the atmospherical air. I employ for this purpose a frame or scaffold, constructed of timber, in any convenient manner, which I fill with fir chippings in such a way as to expose this chipping as much as possible to the access of atmospheric air. The solution of sulphate of ammonia is then made to flow gently over the chipping, and being received in a flat chest placed under the chipping, is pumped up again, until it is observed to be entirely converted into sulphate of ammonia, which is afterwards used for decomposing common salt, as is hereafter described. The manner of trying the sulphate of ammonia, or its being perfectly formed, consists in the addition of a few drops of sulphuric acid to a small portion of the liquid. If, on such addition, a smell of sulphurous acid be observed, the oxidation is not yet entirely finished.

I do not claim, as the invention, the mode of prepararing sulphate of soda by the decomposition of common salt, nor do I claim the conversion of sulphate of soda into sulphuret of sodium, nor the calcination of sulphuret of copper, nor do I claim any particular construction of apparatus which may be used for the process, nor do I claim certain proportions in which the substances used for the process may be applied, but I claim as the invention, consisting in certain improvments in the manufacture of caustic soda and carbonate of soda, the decomposition of sulphuret of sodium by the protoxide of copper, and, in combination with this process, the production of sulphite of ammonia, and also, in the conversion of sulphite of ammonia, to the sulphate, in the manner hereinbefore described."

GANNAL'S PROCESS FOR EMBALMING.*

2·68 lbs. troy of dry sulphate of alumina are dissolved in ·88 (or rather more than ¾ of a pint of hot water). Five or six pints of a solution made after these proportions, are to be injected into all the vessels of the body to be embalmed.

To prevent the attack of insects, it is proper to add 15·43 grs. of chloride of copper to every 2·68 lbs. troy of sulphate of alumina, or 771½ grs. of arsenic.

* *Inventor's Advocate.*

METHOD OF FIXING PHOTOGRAPHIC IMAGES.†

BY M. H. FIZEAU.

Since the first publication of photogenic processes, every one, and M. Daguerre first, has acknowledged that some improvement was yet needed to give to their wonderful images all possible perfection; I mean, to fix the impressions and to give more intensity to the lights of the picture.

The process which I submit to the Academy appears to me capable of effecting both these objects; it consists in treating the impressions, with the aid of heat, by a salt of gold; prepared in the following manner:—

A gramme of chloride of gold is dissolved in a pint of pure water: three grammes of hyposulphate of soda are also dissolved in a similar quantity of pure water: the former solution is then gradually poured into the latter, stirring all the while: the mixed liquor, at first slightly yellow, soon becomes perfectly limpid. It appears to be a double hyposulphite of soda and gold, rather than a chloride of sodium, which seems not to act any part in the operation.

To treat an impression by this salt of gold, the surface of the plate must be quite free from foreign bodies, and especially from grease; consequently it must be washed with more than ordinary care. The following method of washing I have found most successful:—

The impression being quite iodized, but free from dust and grease on the two surfaces and the edges, a few drops of alcohol were poured on the iodized surface; when the whole surface was well wetted with alcohol, the plate was steeped in water and afterwards in a solution of hyposulphite of soda. This solution should be renewed with each impression, and should contain one part of the salt to fifteen of water: the remainder of the washing may be effected in the ordinary way; the washing water should, as far as possible, be free from dust.

The employment of alcohol is simply with the view of making the water adhere to the whole surface of the plate, and of preventing it from running off the edges at the different immersions, which infallibly produces stains.

† *Academie des Sciences;* Sitting of the 10th of August, 1840. *Comptes Rendus,* No. 6.

When a plate has been thus cautiously washed, the treatment by the salt of gold is very simple: it suffices to place the plate in an iron wire frame, to pour upon it sufficient of the salt of gold to cover it, and to heat it with a powerful lamp: the impression becomes clear, and acquires, in a minute or two, great vigor. When the effect is produced, the liquid must be poured off and the plate washed and dried.

In this operation, silver is dissolved, and gold is precipitated on the silver and on the mercury, but with very different results; indeed, the silver which forms the shades of the picture, is in some measure turned brown by the thin layer of gold which covers it, whence the shades are rendered more powerful; the mercury, on the contrary, which, in the state of infinitely small globules, forms the lights, is increased in its solidity and lustre by its amalgamation with gold; whence results a great fixity and a remarkable increase in the lights of the image.

The memoir concluded by considerations concerning the chemical actions which take place during the different stages of the operation.

IMPROVED MODE OF MANUFACTURING GAS, AND PREVENTING SMOKE FROM COAL FIRES.*

Various methods of producing inflammable gases, by the decomposition of water by means of ignited carbon, in which both the elements of water (oxygen and hydrogen) combine with the carbon, have been lately brought before the public. The simplest, and most effectual plan is by passing steam through the retort charged with coal. In this way, any coal, even anthracite, which contains no gas whatever, may be made to produce gas of the finest quality. This plan has lately been adopted with great success in the Paris gas works, and has been tried with equal success in this country, upon a small scale. Using bituminous coal in this way, the entire combustible matter of the coal is converted into gas, consequently, neither tar nor coke is obtained, but an infinitely greater proportion of gas, and that possessing extraordinary powers of illumination. The plan possesses also these advantages, which are of some importance in crowded situations, with an increasing demand for gas-lights,—that the gas may be generated much more rapidly, and requires no purification. This plan will also prove of great value in districts possessing coal containing little or no gas.

It being thus proved that the vapour of water passing through ignited coal converts the whole combustible portion of the coal into inflammable gases, it follows that a well-regulated supply of vapor to a bituminous coal fire would prove an effectual preventive to smoke—smoke being merely the tar and light particles of coal, or lamp black, escaping unburnt from the fire, which would by this application be converted into the gases, carbonic oxide and carburetted hydrogen. A simple and effectual method of applying the vapor, under careful regulation, offers itself by the adoption of a newly-invented fire-grate, consisting of a hollow frame, to be kept filled with water, upon which the grate bars rest, so contrived that a portion of vapor may be kept continually passing through the fire. The same contrivance preserves the bars from burning, and the coals from clinkering. This invention is, we are given to understand, about to be submitted to the public, and, should it turn out successful in practice, upon a large scale, will prove a great benefit to the metropolis, as, should it be adopted in the large breweries and distilleries, the atmosphere will be relieved of much of the densest of the smoke with which it has been hitherto so much impregnated.

* *Mining Journal.*

ON THE KILLING OF MERCURY.

To the Editors of the Chemist.

October 15th.

GENTLEMEN,—Among the many chemical manipulations in existence, I know of no one less understood, and yet requiring a perfect knowledge of every chemist, than the *killing* of mercury, as it is called.

The vast quantity required in the agricultural districts for smearing sheep, &c. would scarcely be credited by any London chemist, and the uncertainty attending the trituration usually employed, is such, that a few hours' labor, with the same ingredients and atmosphere combined, will produce the same result that at other times as many days are required for.

I wish you, or some of your correspondents who may have paid attention to the subject, would give their opinions as to the best mode of killing—say six pounds at a time.

The explanation in Phillips's Translation of the Pharmacopœia is very unsatisfactory, as he reprobates the use of Ol. Sulphuretum and Terebinth. without offering substitutes, and with the following remark closes his information by saying that "he has been assured that the admixture of a portion of old ointment greatly facilitates the operation,"—what quantity, or why it so acts, he does not attempt to explain.

One method, and as good as any other that I am acquainted with, is

Hydrargyri, lb. vj.
Serum ovillum, ℥viij.
Oleum sulphuretum, ℥iv.

Rub until the globules disappear, which is ascertained by smearing a very small quantity on a piece of brown paper; if no globules then appear, it is considered fit to mix with the lard.

I have made many tons weight in this manner, and have not heard any complaint of its want of effect. The uncertainty of the time required for the trituration and the obtaining a result by mere chance, is attended with so little satisfaction, that I trust, through your ably conducted periodical, to be made acquainted with the cause of the effect, and the effect of the cause.

Yours respectfully,
A SUBSCRIBER.

ON THE GALVANO-PLASTIC ART.

A correspondent, M. Z——, of the *Journal des Connaissances Necessaires et Indispensables*, gives the following process in a letter to M. Chevallier, the editor of that journal:—

"It is well known, says M. Z——, that Professor Jacoby of St. Petersburg has lately published an interesting discovery, which consists in taking metallic impressions, by means of a very powerful electro-galvanic apparatus. In Germany, this method is called *galvano-plastic*."

"Allow me," continues he, "to acquaint you with a simple and easy process by which, without any costly galvanic apparatus, the most beautiful impressions may be obtained.

A strong solution of sulphate of copper is prepared; it is filtered, and in the solution is put a piece of zinc of convenient size and form, and on this piece of metal is put the object whose impression it is desired to obtain, or the piece of zinc may be put by the side of the object, on a sheet of copper. The whole is submerged in a solution of sulphate of copper contained in a hollow plate: it is immediately remarked that a crust of copper is formed on the object of which we wish to obtain the mould. It is left to stand for some days, taking care to remove the zinc, and the object to be moulded from the solution, every five or six hours, in order to wash off any black oxide that may have been formed, and a fresh solution of sulphate of copper is used; the cupreous crust will in a short time be formed, and sufficiently strong to be able to be very easily detached: it will be seen that it bears the finest and most delicate impression of the object. By thus operating on images produced by the daguerreotype, an engraving or an engraved plate may be obtained from which impressions may be produced on paper, after the manner of copper-plate engravers. If it be wished that an impression of only one side of the object should be made, then the latter is placed on the sheet of copper, and a border of wax is made round it, so that the solution cannot be introduced between the two, and the operation is carried on as above. When the crust is formed, the wax is melted, and the impression may very easily be detached.

III. PHARMACY, &c.

SARSAPARILLA AND ITS PREPARATIONS.*

BY MR. JOHN MACKAY, OF EDINBURGH.

Sarsaparilla is a medicine which, for nearly three centuries, has at one time been raised to the first rank in our remedial agents, and at another sunk almost to obscurity. Perhaps upon no subject are the medical profession more divided at present, than the merits of this substance, and to no preparation does the pharmaceutist generally do less justice than to the Decoct. Sarsæ. Co., and the other forms of prescribing sarsaparilla. This is the more to be regretted, since this medicine, like most others, varies in its effects, according to the care bestowed upon its preparation; and I am inclined to believe that much of the disgrace to which sarsaparilla has been consigned might be traced to the imperfect production of some of its compounds. In addition to this, the prejudices of some medical gentlemen, conjoined with the disinclination of the patient to pay so much for this medicine, militate against its general and frequent use. It is, however, foreign to my purpose to enquire into the claims which the sarsaparilla has to a more extended use, or to the question, whether the beneficial effects produced by the compound preparations arise from the root itself, or from the other woods entering into combination. My object is, to draw the attention of the chemist to the fact, that insufficient care is taken with the preparations. But though the charge which I am about to

* Communicated by the Author.

make applies to many druggists, yet I would wish it to be understood that there are not a few honourable exceptions.

The forms under which Sarsaparilla are recommended are:—Decoction, Extract or Essence, Lozenge, and Syrup.

Of all preparations of sarsaparilla, the Compound Decoction appears to be the one upon which most dependence can be placed. Great carelessness is practised in making this fluid. From the dark colour and sweet taste of the decoction, the patient has no criterion by which to judge of its excellence,—unless it is sent of so pale a color as to attract his attention. I have seen decoction sent out, bearing the same reference to proper medicine that small beer does to porter. We shall be more convinced of this by comparing the general with the proper mode of producing the decoction. The former consists in throwing a deficient quantity of the root amongst water, placing upon the fire, boiling for half an hour, adding the mezereon, &c.; continue the boiling a little longer, remove, strain, and we have the decoction. I have known the process completed, and the fluid sent away to the patient within an hour. It is no uncommon thing to make the *fresh* decoction by mixing the fluid extract with water. The latter is well followed, by attending to the formula given by the College. I have invariably found, however, that the decoction is rendered more powerful by keeping the liquid during five hours a *little below* the boiling point, allowing it to simmer, and stirring it frequently. Nothing is better for this purpose than a hot plate, heated so as to prevent the liquid being raised so high as 212°. I never *bruise the root*, and for this reason, that as the whole virtue of sarsaparilla is known to reside in the cortical part, which lengthened maceration even in cold water will reach,—so no step is gained, but that of rendering the preparation thick and sandy, by crushing it. Thus, without increasing the power of the preparation, it may be rendered more nauseating to the patient.—When the guaiac. sasafras. mezereon, and liquorice are added to the hot simple decoction, the liquid ought to be kept at the boiling point no longer than fifteen minutes,—and during this time the cover should be kept as closely as possible upon the vessel. So much is dependent upon the decoction being carefully made, that one of our most celebrated surgeons in this town, (from the very bad preparations sent out repeatedly by some druggists,) is in the habit, when recommending this medicine, to order only the herbs, advising his patients to make their fireside the laboratory. Attention is required to the mode of preparation of the decoct. sarsæ. co., and is loudly called for. The simple and compound extracts have of late fallen much into disuse. We cannot be surprised at this. The term "*in vacuo*," as applied at the present time to the preparing of extracts is often erroneous, and more for the sake of euphony, as there are some, who, boiling the liquid in an open vessel for twelve successive hours or more, give the above term to their production. Even more liberty is taken by some in forming their fluid extract or essence; for the great aim of many is to produce a very dark-looking, thick fluid; to accomplish which, they hesitate not to add *gum acac.* to do the one, and *sacc. elycynh.* to accomplish the other. To this the high-sounding title of "*Fluid ext. sarsæ. prepared in vacuo to the entire preservation of its excellent qualities, forming in* ONE MINUTE *the decoction as ordered by the Pharmacopœia*," &c., is given and recommended, from its portability and superior qualities to the real decoction prepared from the fresh ingredients. I know this to have been done, and have examined such a preparation. I am inclined to believe that few of the "*concentrated essences*,"—made for convenience, and possessing such transcendant powers, possess much activity. Many of them are not prepared *in vacuo*, and as we know that the morphia in opium,—the cathartine in senna, and some other principles are destroyed by continued boiling,—may not the sarsine be also partially dissipated by long boiling. Like many others, I detest quackery much, and yet I fancy, that this or something closely approaching it, is carried on to a great extent, in this particular medicine.

About four years ago the sarsaparilla lozenges created some stir, but are now almost exploded. Upon their first introduction they were recommended as an alterative,—a remedy in all cutaneous diseases,—and for weakened digestion. I suspect that they were more to please the taste,—and received notice from being new, than from any power which they had. I subjoin a formula, according to which I believe some were made, which will serve to show the small, trifling quantity of the extract contained in each lozenge.

TROCH. SARSÆ.

℞ Extract sarsæ. simp. . ℥viij.
Elycynh. pin. . ℥iij.
Solve in aqua bullient. ℥xvj. fiant solutio et miscеantur ā pulv. sacch. alb. 26 lb. Gum acaciæ 2 lb. vel q. s. ft.

Divide in troch.

The above should produce 28 lb. lozenges, when dried, cut of an oval form, resembling somewhat the troch. papaver. in appearance.

Of course they may have been made of various strengths, but some were made ac-

cording to the above proportions. Now, upon calculation, we shall find that each lozenge would contain about the fourth of a grain,—not a very large quantity, certainly. They are, however, little known now, and rarely used. The syrup is the only remaining preparation,—it however merits little notice, as it appears to be more a *placebo* than an active agent. Containing so large a quantity of saccharine matter, is against its general employment, preventing a sufficiently large dose to be repeated without injurious effects to the stomach. It may, however, form a very useful adjunct to some more powerful preparation. The colleges give formulæ for its formation, but unless in some very peculiar states of the constitution,—to sweeten the decoction,—or for children,—I do not suppose that it is frequently employed in medicine. Sarsaparilla has also been used in the form of powder, and I understand with beneficial results. But there are many objections to the employment of sarsaparilla in this state. The large quantity of woody fibre in each dose, and the liability of the powder to spoil when kept, are much against it.

In the use of sarsaparilla as a medicine, there is no better way of testing its powers than by preparing the decoction carefully and at intervals of two days,—when kept longer than this, even in a cool place, it is very apt to spoil, from the large quantity of vegetable matter which it holds suspended. But a thing of primary importance is that of obtaining a good sarsaparilla. Much useless root is sold, for by long keeping the active principle lying between the woody part and the bark, becomes quite mouldy, and thus the medicine is nearly inert. This will be visible to any one by breaking a portion of it across, and exposing this part. Always obtain a fresh sarsa, and have it invariably cut with the radicles on. The interior of the cortical part should have a dark red colour, and the root of a moderate size. The Jamaica is the best, and far superior to the Lima, which is the one generally sold. A little time ago none of the former was to be had in the London market, and a great deal of the latter kind was vended at a lower price. If more attention were paid to the selection of the root, and to the mode of preparation, few medicines would, I think, be more celebrated than the compound decoction, when made fresh once in two days, and ℥xij. drank during each day for a period of three or four weeks.

Edinburgh, E. S.

ON POISONING BY AMMONIA.—REMEDIAL MEASURES.*

BY DR. ALPHONSE SOUCHARD.

On the 10th of June last, at a quarter before twelve at night, we were called on to attend M. Antomarco Piétri, pupil of M. P., pharmaceutical chemist at Batignolles. This unfortunate young man, whom the neighbours and ourselves had seen in full health a few minutes previously, was in the greatest danger: we were informed that he had just been found in an atmosphere of ammoniacal vapour, for a length of time which we could not exactly calculate, but which we thought to be about three quarters of an hour. This accident was caused by the breaking of an enormous stone bottle, containing no less than fifty quarts of volatile alkali. It had been sent in the very same evening by the merchant, and M. Piétri being too busy to be able to take it down into the cellar, it was imprudently decided that it should remain for the night in a corner of the shop. Nothing happened until M. P. went to bed; but by an unfortunate fatality, a very short time had elapsed since he had retired into a small bed-room joining the shop, the door of which he was in the habit of leaving open, when he was awakened by a sensation of violent constriction of the throat, and a great difficulty of respiration. It was the bottle of ammonia, which, no doubt, too high a temperature had broken. M. Piétri, disturbed in so unexpected a manner in his first sleep, not knowing at first what to attribute it to, immediately ran into the shop to gargle his throat with water; but he had no sooner entered it, than he felt completely suffocated, and would certainly have died on the spot, if a good woman, who slept at a little distance, and whose attention was attracted by the cries of the unfortunate young man, had not promptly run to his assistance, and arrived, at all hazards, to save him from such danger.

We found the patient, on our arrival, in the following state:—

He was still in the corridor leading to the shop, supported by several persons: our first care was to carry him into the open air in a neighbouring yard, quite free from ammoniacal vapour. His posture and gestures indicated great anxiety: the face, the features of which were violently discomposed, had red patches on it, so much the more vivid as they approached the natural apertures: the mucous membrane of the nostrils and lips was destroyed: from the nose and mouth flowed a bloody foam, which already soiled his shirt: the tongue, which was of a bright red, seemed

* *Journal de Chimie Médicale*, Sept. 1840.

to be deprived of its epithelium; on some parts it was covered with a thick white mucus, which might have been taken for portions of false membranes: the whole buccal cavity presented nearly the same character: the patient, from whom we could obtain only sounds of a weak and inarticulate voice, at first complained of a sharp pain in the throat, but which soon extended to all the chest: respiration was extremely difficult, and there was a continual danger of suffocation; by auscultation we heard only a tumultuous rattle; thirst was excessive, but deglutition was almost impossible; the efforts which the patient made to swallow the drink presented to him brought on a very painful cough, which caused, at very distant intervals, an expectoration of mucous matters; the skin was hot, but not very dry: the pulse weak irregular, and frequent; no convulsive motions; the eyes were red and sparkling; the forehead, all the vessels of which were charged with blood, was hot to the touch. We did not hesitate to bleed copiously, and we had the satisfaction of seeing, after blood had been taken away, that the blood which accompanied the expectoration disappeared, which contributed not a little to re-assure the patient. Immediately after, M. Piétri having been removed into a bed which had been prepared for him in a suitable place, we had recourse to vinegar water. Its injection, although troublesome and very painful, was not long in showing good effects; for two hours had scarcely passed in the midst of indescribable anguish, when auscultation furnished us with more satisfactory signs: thus, instead of the rumbling noise which it would be difficult for us to characterise, which we remarked at first, we could recognise some points of the left side, where respiration, although still difficult and stertorous, might be perceived, whilst on the right side it retained all its known characteristics: besides, the patient seemed to suffer less: his attention was devoted only to his throat, and, indeed, deglutition very soon became impossible. By the application of a good number of leeches, *loco dolente*, we were again able to combat this symptom; revulsives, frictions, astringent gargles, purgative injections, and bathing, completed the treatment we thought fit to adopt in this case. At the expiration of forty-eight hours, we could declare that M. Piétri was saved. Still for some days he showed all the symptoms of acute bronchitis, with abundant expectoration: he was subject to complete aphony for five or six days; but this ceased, and he is now perfectly recovered.

The fact noticed by Dr. Souchard is extremely curious; he acquaints us with the remedial measures to be taken in cases of poisoning by ammonia.

We have delayed the publication of this interesting case, waiting for the decision on the following case of poisoning by ammonia. The court of assize for the department of the Seine, has been occupied with an accusation against Louis Frederic H——, aged six years, who had poisoned his little sister, on the day of her baptism, by putting into her mouth several spoonfuls of ammonia, and who, being out of patience at her not dying, introduced a long hair pin into the ear of his victim: but this affair was not concluded, H—— having died in prison, of disease of the lungs.

Ammonia has already been known as a poison, and Perey, *Bulletin de la Faculté*, has published the case of the son of an apothecary who fell a victim to the bursting of a bottle of ammonia. Syster says that he has seen an epileptic patient, who had been unskilfully recovered, die two days after of croup, and it was discovered, on the *post mortem* examination, that a false membrane had been formed. Fourcroy, in the *Encyclopedie Methodique*, makes known the serious symptoms resulting from the inconsiderate use of ammonia in a case of syncope.

ON A NEW MODE OF USING MARSH'S APPARATUS IN MEDICO-LEGAL INVESTIGATIONS.*

BY M. LASSAIGNE.

It is well known that this apparatus is capable of detecting the presence of $\frac{1}{100000}$ of arsenious acid in solution in water, by taking certain precautions indispensable to the condensation of the arsenical vapor on the porcelain saucer or capsule. These precautions, for such minute quantities, are:—

1st. To take care that the flame of the gas in combustion be neither too powerful nor too weak.

2nd. To hold the porcelain capsule in a slightly inclined position, which arrests the jet of the flame.

3rd. To ascertain the precise moment when the arsenious acid, diluted in a great quantity of water, is decomposed, and passes to the state of arseniuretted hydrogen; now, this moment is not indicated by any particular sign; it is only by testing, from time to time, the flame on the capsule, that it is rendered evident by the appearance of a slight variegated greyish yellow stain, which is the precursor of the disengagement of arsenic.

* *L'Institut*; No. 355, Oct. 15, 1840.

The difficulty which these circumstances present, has led M. Lassaigne to invent a means which, truly speaking, is only an application of the known properties of arseniuretted hydrogen, and serves to characterise it. It consists as follows:—

The gas disengaged from Marsh's apparatus, is driven into a solution of pure nitrate of silver; the arseniuretted hydrogen, which is found mixed with the hydrogen gas, is gradually decomposed by the oxide of silver; the latter is then reduced, the liquor turns brown, metallic silver is deposited at first in black flocks, and arsenious acid is produced and remains in solution mixed with the excess of nitrate of silver employed. All the arseniuretted hydrogen having been absorbed and decomposed, hydro-chloric acid is gradually added to the solution, in order to decompose the excess of nitrate of silver and to convert it into the chloride; it is then filtered to separate this chloride, which is then found mixed with the metallic silver precipitated at the time of the passage of the arseniuretted hydrogen, and it is evaporated at a gentle heat, in a porcelain capsule. During the concentration and evaporation, the nitric acid contained in the liquor acts on the arsenious acid, converting it into arsenic acid. This latter forms the residue of the evaporation, and it is then easy to clearly ascertain the chemical properties.

The author asserts that he has applied this process to detecting one milligramme of arsenious acid dissolved in 1000 grammes of distilled water. He remarks that the absorption of the gas by the nitrate of silver, allows of *all* the arsenic which is disengaged in the gaseous state from Marsh's apparatus, being gathered, whilst, by the common method, which consists in burning the hydrogen under the form of a jet, which is deposited on the capsule, indubitably a great part must be lost.

ON CERTAIN CAUSES OF ERROR WHICH MARSH'S APPARATUS MAY OCCASION IN MEDICO-LEGAL INVESTIGATIONS.*

BY M. LOUYET.

If we heat a piece of a phial by means of the blowpipe, the heated part soon becomes red, for the sides of phials are very thin: afterwards, if it be left to cool, a circular stain will be observed, more or less deep and brilliant, and in every respect analogous to those which the flame of Marsh's apparatus produces on glass or porcelain, containing arsenical matter decomposable by hydrogen or sulphuric acid. If for a piece of phial glass a piece of any other glass, such as glass tube, a watch-glass, &c., be substituted, this phenomenon does not occur: it is also well to remark that these stains are formed at the heat of reduction, and disappear in the heat of oxidation. If for the blowpipe and the lamp or taper, a Marsh's apparatus containing distilled water, pure zinc, and sulphuric acid, be substituted, and if the flame of the hydrogen produced be directed on a similar piece of phial, the brilliant stains again appear; as in the preceding experiment: these stains are formed at the heat of reduction, and disappear at that of oxidation. By alternately applying the heat of reduction and the heat of oxidation, the brilliant stain formed on the glass may be made to appear and disappear repeatedly. The flame of hydrogen, applied to pieces of other kinds of glass, produces the same negative effect as that of the taper and blowpipe.

At first I thought that the glass of the phials contained arsenious acid—a substance of very frequent use in glass-houses—and that this substance was decomposed either by the action of heat and of the matters contained in the glass, or by the carburetted hydrogen which the inner flame of the Marsh's apparatus might contain, and which the flame of a taper or of a lamp always contains; but I was compelled, by the following experiments, to renounce this hypothesis:—

Ten parts of broken phial glass were powdered and put into a platinum crucible with thirty parts of potassa; the whole was exposed to a red heat, in a reverberatory furnace. The crucible having been withdrawn from the fire, the matter, when cold, was dissolved in a certain quantity of distilled water. The silica was precipitated by pure sulphuric acid, separated from the liquid by filtration, and washed several times with distilled water; the washing waters were added to the filtered liquor, and the whole was exposed to a gentle heat until reduced to one-third. It was then immediately put into a Marsh's apparatus, holding a quart, and containing distilled water and *pure* sulphuric acid and zinc. The hydrogen gas which was disengaged was lighted, but its flame deposited nothing on a porcelain plate. Two drops of a solution of binarseniate of potassa were introduced into the apparatus, and I immediately obtained many brilliant variegated stains of metallic arsenic. The glass then did not contain arsenious acid, for that body would have combined with the potassa, and its presence would have been detected by the flame of the hydrogen gas.

Although unable to give any pausible

* *Royal Academy of Sciences*, Brussels; Sitting of June 6th, 1840.

explanation of the formation of these stains, I have noted this fact, because it may occur in using Marsh's apparatus for detecting arsenical matters, that pieces of medicine bottles may be used for condensing the arsenic which is afterwards believed, on account of the stains, to have been found where in fact it did not exist. I am well aware that we cannot depend on the single character of the formation of brilliant stains, to prove with accuracy the presence of arsenic in the matter examined, and that besides, it is necessary that these stains should be soluble in nitric acid, thus forming a liquid which precipitates nitrate of silver of a yellow colour, &c. &c.; but inexperienced persons might be deceived by them. I may add also, that having boiled a quantity of fragments of these phials in nitric acid, for about two hours, the concentrated liquid gave not the least precipitate with nitrate of silver.

MARSH'S APPARATUS FOR DETECTING ARSENIC.*

An article in the *National*, on the means of detecting arsenic by Marsh's apparatus, contains some details that are not without interest as connected with the proceedings in Madame Laffarge's case. It appears that this apparatus is of the most astonishing sensitiveness for the detecting of arsenic in the minutest quantities submitted to its action; so much so, that Mr. Marsh himself, by a modification of his process, has detected the presence of this poison when operating upon only one drop of arsenical solution, containing the one hundred and twentieth part of a grain of arsenic. The principle upon which the apparatus is framed, is this—that hydrogen gas has to be formed in the midst of the matter suspected to contain arsenic; that this gas is to be burnt on coming out of the apparatus; and then that the products of this combustion should be examined. One of the principal properties of arsenic is to form a gaseous combination with hydrogen, of an excessively deleterious nature, called arsenicited hydrogen; it burns in this form just like common gas, and leaves as a residue a brown solid matter, or a sort of metallic soot, which is, in fact, the hydrurate of arsenic. If, after the gas is set on fire, a piece of glass is presented to the flame, the combustion is thereby retarded, and there is deposited on the glass a circular bone of metallic arsenic. In Marsh's apparatus a small glass tube is used, and the inflamed gas being admitted into it, there is deposited, if the gas contains any arsenic at all, first, metallic arsenic at the part of the tube in contact with the flame; secondly, white arsenic or arsenical acid a little higher up the tube; thirdly, a strong smell of garlic, the arsenic smell, at the other end of the tube. It is an apparatus of this kind that has been used in the experiments by the chemists at Tulle. Since, however, this method detects arsenic in such exceedingly small quantities, it becomes liable to objections when used in cases of forensic medicine. Thus the zinc employed to make the hydrogen gas may itself contain arsenic, as it nearly always does in small quantities; the sulphuric acid employed for the same purpose may contain arsenic, as the English acid nearly always does; and, in short, the most extreme care is requisite in discriminating as to what source the arsenic comes from, when its presence is detected by the apparatus. When, however, Marsh's method fails in detecting any arsenic at all, it may be taken as a most positive test that there is no arsenic whatever in the substances examined.

* *Galignani's Messenger*; and *Inventor's Advocate*.

ON THE TESTS FOR SULPHURIC ACID WHEN THROWN ON THE PERSON.†

BY R. D. THOMSON, M.D.

The author's object was to take into consideration the accuracy of the various modes of testing sulphuric acid when employed for criminal purposes, and particularly when thrown on the person. A case had lately occurred to him in practice, which was brought before the last session of the Central Criminal Court, which proved that the mode of determining the presence of *free* acid by *mere* testing was by no means satisfactory. In a fit of rage a woman threw a quantity of oil of vitriol in the face of a cab-master in the vicinity of Euston Square, and before the unfortunate sufferer could wash off the acid two minutes had elapsed, and loss of sight was the consequence.

Dr. T. stated that having attentively considered this case, and having made a series of experiments on the eyes of dead animals, he had discovered that this sort of blindness was perfectly curable, and he had accordingly proposed an operation for this purpose in a paper read at the Medical Section. But besides having his face injured, the man's hat was discolored also by the acid. This was sent to the author, to

† British Association: Meeting at Glasgow, Sept. 1840.

determine the nature of the agent in this work of destruction. The result of his experiments was, that the injured hat, as well as an uninjured one, contained sulphuric acid, as tested by nitrate of baryta, and a solution of the soluble matter of both states of this article of dress afforded an acid reaction.

It was therefore necessary to adopt some method which would afford a discriminatory test between the free and combined acid; the usual mode of boiling with casbonate of lead, and concluding, if any insoluble sulphate of lead was formed, that the acid existed in a free state, was found to be totally fallacious, because carbonate of lead decomposes sulphate of soda, contrary to the opinion stated in works of medical jurisprudence. Moreover, it was shown that many of the usually so called neutral sulphates exhibit, in reality, an acid reaction on test paper, as in the instances generally of sulphates of potash, iron, soda, barytes, and also in the cases of alum, &c.; hence the excess of acid attached to these salts would be apt to act as free acid upon the barytes test.

Dr. Thomson therefore concludes that the only demonstrative proof which chemistry affords is a quantitative analysis. He found the entire hat to contain ·356 per cent. of sulphuric acid, probably in the state of alum or copperas, and the injured hat 1·379 per cent.; or, in other words, the hat had received by the injury 1·023 per cent. of free sulphuric acid. Here was afforded clear evidence of the nature of the agent employed to effect the injurious object, which could not have been conclusive if the matter examined had only amounted to a drop or a stain. The author directed attention to a point connected with sulphuric acid in a medico-legal point of view, viz. that the oil of vitriol of commerce always contains, in this country, nitric acid, in addition to various other impurities.

M. Barruel has stated that sulphuric acid is capable of dissolving platinum. The author has not been able to satisfy himself that it dissolves any sensible quantity of gold leaf. M. Barruel attributes the property, which he states it to possess, of dissolving platinum, to the sulphuric acid assuming the function of muriatic acid. But the author is not aware of any experiment which authorizes this conclusion. He is rather inclined to attribute the action, if such an occurrence takes place, to the muriatic acid which is present in all the oil of vitriol prepared from sulphur that he has examined. It is given out in sensible quantities when a solid oil, such as cocoa-nut oil, is acted on by sulphuric acid. This he ascertained several years ago, when examining some Indian oils, and Dr. Kane has since corroborated the fact of the existence of muriatic acid in oil of vitriol, although the author has not been able to observe the solution of any sensible quantity of gold leaf by the action of oil of vitriol *per se*; yet if a few drops of muriatic acid be added, the action becomes very powerful, and by the application of heat platinum also is dissolved.

These facts, therefore, prove that whenever we have oil of vitriol we may expect also nitric acid. The author added, that he knew of no certain mode of detecting the presence of nitric acid save by the property which it possessed of dissolving gold and platinum by the addition of muriatic acid.

Pure morphia has no action upon nitric acid. It is the resin which generally accompanies that alkaloid which produces the characteristic yellow colour. But the author found that preparations of opium in which the resin was excluded, afforded no colour when nitric acid was added.

From an examination of numerous cases of poisoning by opium which had appeared before the Middlesex coroners, he had come to the conclusion that the resin-of-opium test for nitric acid, afforded only an auxiliary method of arriving at the truth, as its characters were frequently usurped by other organic substances.

MODE OF DETECTING MINUTE PORTIONS OF ARSENIC.

BY DR. CLARK, OF ABERDEEN.

This mode had been applied by the author to the detection of arsenic in commercial specimens of the metals tin and zinc. Grain tin, made in Cornwall, contains arsenic, which seems to be the occasion of the peculiar smell of the hydrogen evolved from that metal by the action of acids. All the specimens of commercial zinc that the author had happened to try were found to contain arsenic. Pure muriatic acid, diluted with distilled acid, is poured upon the metal, and the hydrogen evolved is passed first through a solution of nitrate of lead, and next through a solution of nitrate of silver. Nitrate of lead seems not acted upon by arseniuretted hydrogen,—at least, when in very small proportion; but were any sulphur present in the metal, sulphuretted hydrogen would be evolved in consequence, and the solution of nitrate of lead would be blackened, which, however, the author did not observe ever to occur. But nitrate of silver seems immediately to be acted upon by most

* *British Association for the Advancement of Science*; Meeting held at Glasgow, September 1840.

minute portions of arseniuretted hydrogen. A bluish black precipitate is formed, which, to judge from a qualitative analysis, appears to be an arseniuret of silver. This bluish black precipitate may be collected with remarkable facility, from its falling readily from the solution, which it leaves perfectly clear. Heated in a small tube, so that the matter heated comes into contact with the air, the bluish black precipitate evolves arsenious acid, which, by the liquid tests, may be further satisfactorily recognized. Antimony produces a similar precipitate, so that the mere appearance of the precipitate is not enough, without the production and recognition, by the usual methods, of the arsenious acid. By a few evident modifications, this method may be applied to medico-legal investigations.

Dr. R. D. Thomson had found that the electrical method of Mr. E. Davy was inapplicable, in consequence of the deposition of a black matter from the zinc, which he had considered to be bitumen. Dr. Clark has, however, proved it to be arsenic.

MADAME LAFFARGE'S CASE.

To the Editors of The Chemist.

Oct. 3d, 1840.

GENTLEMEN,

In No. X. of The Chemist for Oct. I perceive the statement made by M. Orfila to the Court, on the trial of Madame Laffarge, respecting the detection of arsenic in the body of M. Laffarge. I am quite aware of the just celebrity of that great and distinguished chemist, yet I venture to address you a few lines on the possibility of his being mistaken.

It is indeed but a mere possibility, but as I am certain there is no man who would sooner confess an error, and endeavour to repair it than the gifted Orfila, could he be assured he had committed one, I submit the following to consideration.

He informed the Court that the tests were pure; but if I am correct in my recollection of the report, he merely mentioned that the nitric acid and the nitrate of potassa were pure, but he did not say the sulphuric acid or the zinc used in Marsh's apparatus had been tested for arsenic, and he admits the apparatus in question to be of recent date, and not generally understood. When it was first made public it was considered as certain in its results even in the hands of the most inexperienced; but subsequent trial has proved that it is liable to fallacy by the *production of arsenic* from the materials themselves used in the preparation of the hydrogen gas, should they accidentally be contaminated with that metal. Sulphuric acid often contains arsenic in solution, and the zinc of commerce is almost always impregnated with it. Thus, if M. Orfila did not purify these agents, or if they were not originally pure, the arsenic produced may have arisen from them, instead of from the body of Laffarge.

Turner, in his Elements of Chemistry, under the head Arsenic, is most explicit on this subject, and I refer you to his work for further particulars.

I am sure you will do me the justice to believe, it is not my intention for a moment to call in question the skill of such a celebrated man as Orfila, but rather that what I have written has been with the distant hope of saving an unhappy and miserable woman from a dreadful punishment, should it turn out that the agents *used* in Marsh's apparatus were impure.

I am, Gentlemen,
Your most obedient
Humble Servant,
A SUBSCRIBER.

ON THE PREPARATION AND EMPLOYMENT OF SESQUI-IODIDE OF IRON.*

BY DR. OBERDÆRFFER.

Iodide of iron is so easily decomposed that the apothecary is often obliged to renew it, although it is but seldom asked for. The author has ascertained that this iodide, prepared and kept with the greatest care, gives rise, in a certain time, to precipitates, if used in solution. He therefore conceived the plan of replacing it by a sesqui-iodide of iron, which he prepares in the following manner:

Half an ounce of iodine is mixed with a drachm and a half of iron filings, and an ounce of water, in a glass vessel. When the action commences, it is gently stirred until it acquires a green color, owing to the formation of iodide of iron. It is then diluted with four ounces of water, and filtered two or three times. Two drachms of iodine are then added, and are readily and completely dissolved. From this results a deep brown liquor, to which is added sufficient water to make the whole amount to ten ounces. Each drachm contains about four grains and a half of iodine, and may be kept for a long time without decomposition taking place.

This medicine has long been used at the General Hospital of Hamburgh; it pro-

* *Zeitschrift für die gesammte Medicin.* No. 14. 1840.

duces the same effects as iodide of iron; only it must be given internally, in smaller doses.

The form of syrup is preferable.

ON SYRUP OF VIOLETS.

BY M. POITEVIN.

M. Poitevin, contrary to the opinion given by M. Gueranger, insists on the necessity of washing the violet flowers; he has seen, even when this washing has been operated with distilled water, that it extracted a small quantity of green colouring matter. He recommends not to prolong the infusions beyond six or seven hours, instead of twelve, as is generally done. He uses very fine sugar, but instead of dissolving it in the infusion, he previously makes of it a clarified syrup, to which he adds the infusion, in the proportion of twenty parts to thirty-six of the syrup. By this means he obtains a syrup which is much more transparent, and which is capable of being kept longer.

He afterwards fills new bottles with this syrup, and he puts powdered sugar in the necks of the bottles. These bottles are placed on a marble table, in a dry and dark cellar, and confined in iron cases.

This paper concludes by observations on an experiment of M. Gueranger, who had restored the lost colour of some syrup of violets, by means of dilute sulphuric acid. M. Poitevin has not obtained any good result by this means.

DEATH FROM EATING TOBACCO.*

On Tuesday, 6th October, information was received by the superintendent of police that a man was lying dead on board a trow called the Rival, of Gloucester, then lying at Pillgwenlly. On proceeding thither he ascertained that the information was correct, and, on inquiring into the circumstances, he received the following account, which was confirmed by the evidence subsequently at the coroner's inquest. On Monday evening the deceased, whose name was Charles Long, went on shore to a beer-house, called the Company's Arms, at Pill. He was there joined by the captain of the trow, whose name is James Cooke, and his brother William Cooke. They drank together for some time, when the deceased offered to eat two ounces of tobacco, if any one would bet him half-a-crown. This the captain accepted, when Wm. Cooke, Jesse Franklin (the landlord of the house), and the deceased, went out, and purchased two ounces of roll tobacco. On their return, deceased took a knife and cut up the tobacco into pieces, about an inch in length, and swallowed the whole in two minutes, observing at the same time, that he would swallow two ounces more in three minutes. He then drank four or five glasses of beer, and went on board about seven o'clock. At eleven o'clock he complained of weakness, but appeared to get better; at three o'clock the crew left him and went to bed, and at six o'clock the unfortunate man was a corpse. On Tuesday an inquest was held on the body by W. Brewer, Esq., coroner, when the foregoing facts were deposed to, and the following verdict was returned:—"Died from the effects of eating tobacco, taken voluntarily by himself."

* From the *Monmouth Merlin*.

TO CORRESPONDENTS.

THE "short sketch" spoken of by a correspondent may be left at our publishers for perusal.

Mr. WASNIDGE shall hear from us, by letter, very shortly.

Mr. CALEB COX, Potterne, Wilts.—The price of drugs was omitted for reasons given in *The Chemist*, No. III.—We may add a word to all those who have written to us on this subject, informing them that the petitions against it are more numerous than those for it. We will bear in mind the concluding part of Mr. Cox's letter.

A SUBSCRIBER's observations are taken in good part, but might, we think, have been made in a less assuming tone. In some of his remarks he is decidedly wrong. A Subscriber has not told us anything we did not know before.

NOTA BENE.—*All Communications and Books for Review must be addressed, "To the Editors of The Chemist, care of Mr. Hastings, Publisher, 13, Carey-street, Lincoln's Inn Fields, London." Communications must be pre-paid, and sent before the 15th of each month.*

STEWART AND MURRAY, PRINTERS, OLD BAILEY.

THE CHEMIST.

I. CHEMISTRY.

ON M. DUMAS' THEORY OF SUBSTITUTIONS AND CHEMICAL TYPES.

BY M. BERZELIUS.

THE new form which M. Dumas has endeavoured to give to the theory of substitutions spoken of in my report for the year 1838, has lately attracted the attention of chemists. Some very important experiments, made by French chemists, on the action of chlorine on the ethers, have been explained by them, relying on this new theory: these explanations, which I do not consider as admissible, have, however, obtained the suffrages of many chemists, amongst whom M. Dumas reckons Professors Liebig and Graham. The author of the theory of substitutions, who nimbly leaps over the objections addressed to him, continues his progress and has lately given his theory a new development, in a memoir entitled, *On the Laws of Substitution, and on the Theory of Types.** It is not so much by profound views, and unexceptionable proofs, as by eloquent phrases, dictated by his intimate conviction, that he seeks to persuade us. This theory, probably, will exert some influence, at least for a time, on the researches of organic chemistry, and particularly on vegetable chemistry. I will, therefore, here give an account of the new development of the theory of substitutions, and of that of types.

M. Dumas puts the following questions to be answered:—†

"1st, In every combination, may elements be replaced, equivalent for equivalent, by simple bodies, or by bodies which act as such?

"2nd, Are not these substitutions often effected without the general nature of the compound being altered? Bodies thus produced belong then to the same chemical type as those from which they are derived.

"3rd, In other cases, may these substitutions furnish products entirely distinct, by their reactions, from those which have given rise to them; and is it, nevertheless, expedient to consider them as belonging to the same molecular type?

"4th, May not the nomenclature of organic substances, from this time forward, be perfected in such a way that the name of each body may express the chemical, or even the molecular type to which it belongs?

"5th, Do the phenomena of substitution oblige us to modify profoundly the value attached, until latterly, to organic radicals?

"6th, Is not the electrical action attributed to the elements of compounds by the electro-chemical theory a complete contradiction of the phenomena of substitutions?"

Before answering these questions, M. Dumas briefly explains the history of the new doctrine. M. Gay-Lussac had remarked, some years ago, that wax, subjected to the action of chlorine, absorbs it, giving rise to a disengagement of hydro-chloric acid gas, without the volume of the gas being changed by the operation. The reason of this is, that the wax loses a volume of hydrogen equal to the volume of chlorine gas which it absorbs. M. Dumas repeated this experiment with essence of turpentine, and arrived at an analogous result. Then it was that, guided by many other experiments, he traced, five years ago, the first sketch of the theory of substitutions conceived in three laws. He now allows that the first and second present exceptions, and entirely rejects the third, which says, that in a hydrated combination, the hydrogen of the water is first removed without being replaced, which is inaccurate according to the formation of chloracetic acid.

* See *The Chemist*, No. III., Second Edition, p. 69.

† These questions were given at p. 69; we think it better to repeat them, so that our readers may have the whole subject under their consideration at once.—EDS. CHEMIST.

The conclusions which may be drawn from the somewhat vague manner in which M. Dumas treats these questions are as follows, as to the two first:—

1st, The elements of a compound may, in many cases, be substituted by other elements in equal equivalents, as also by compound bodies which act the part of simple bodies; however, this rule is not without an exception.

2nd, When such substitutions take place, the body, one of whose elements has been substituted by another element, retains its chemical type, and the new element introduced acts the same part as that which has been removed. M. Dumas' reply to the third question is less precise to the purpose, so that it cannot with certainty be said whether it should be considered as affirmative or negative. We shall see proofs of it in that which I shall say farther on. Nevertheless it may be concluded from this reply that where the law of substitutions is looked upon as applicable, the molecular type must be preserved; and if the dissimilar actions of acetic and chloracetic acids with an alkali be compared, it will be seen that the want of resemblance does not appear to hinder the admission of molecular types.

Let us now take a survey of the reasonings on which those answers are based. In order to prove that our ordinary ideas concerning the reciprocal changes of bodies, which he calls the theory of equivalents, are far from being capable of producing what the law of substitutions with the preservation of types is able to realise, he addresses the following question to the theory of equivalents:—What should occur when ether is treated by chlorine? (A question experimentally treated in a very excellent manner by MM. Malaguti and Regnault, to which I shall recur in another part of this report, but which may now be answered by theoretical opinions.) The theory of equivalents may reply, that is not known beforehand; but twenty or thirty combinations are possible, and experiment ought to decide among them. Ask the same question of the theory of substitutions, and it will immediately reply to you: The equivalents of hydrogen, one after another, will successively be changed for equivalents of chlorine, preserving the integrity of the type.

It is easy to demonstrate the little value which such an argument possesses, when it is required to make a deep investigation into a scientific matter. Thus, do we ask the theory of substitutions what will take place when indigo=C^{16} H^{10} N^2 O^2 is treated by chlorine? If the theory of substitutions does not give the reasonable reply that M. Dumas makes what he calls the theory of equivalents to do, namely, that periment will give a solution of it, it will reply:—The hydrogen will be changed, equivalent for equivalent, for chlorine, until no more hydrogen remains. Now, an experiment, to which I shall again refer in the course of my report, shows that the hydrogen is not exchanged at all, but that one atom of indigo-blue may be combined with one or two equivalents of chlorine, without decomposition, forming bodies possessed of totally different properties, which combine with the alkalies, and which act in the new compound as if they contained one of the acids of chlorine or nitrogen.

These are then but words thrown to the wind, when we wish to represent the law of substitutions as a more certain guide in organic investigations, than the ideas commonly received in chemistry; for the provisions of this new theory are, like all partial opinions, true in certain cases, and erroneous in others: it can never with certainty be said beforehand that the substitution of hydrogen, or of another element, for chlorine, will take place, nor, indeed, when it will make compounds of another nature. M. Dumas promises, on the part of the theory of substitutions, things which never can be realised.

I will quote some of his own words to give an idea of the manner in which he treats his subject, and of the kind of proof by which he endeavours to convince such of his auditors or readers as may be less acquainted with the state of the question, than the chemists who do not acquiesce in his views.

"Hitherto, I have reasoned as if the law of substitutions were really applicable only to the substitution of hydrogen, which furnished the first examples of it. But chemists know that, in an organic substance, not only may the hydrogen be replaced, but also the oxygen and nitrogen, as may easily be proved by numerous examples.

"Moreover, carbon may be made to undergo true substitutions, which shows how artificial would be that classification of organic substances, which should be founded solely on permanence of the number of equivalents of carbon in all compounds of the same family.

"In an organic compound, all the elements may therefore be successively displaced and replaced by others. Those which most easily disappear, abstracting certain conditions of stability which it is not yet known how to foresee, are those whose affinities are most energetic. Hence the reason why hydrogen is one of the most easy to be substituted: hence, also, the reason why carbon is one of the most difficult; for we know few bodies which can act on carbon and not on hydrogen.

"I may add, indeed, that the law of substi-

tutions not only permits us to foresee the disappearance of certain, or of all, the elements of the organic compound and their substitution by new elements, but also the intervention of certain compound bodies.

"The law of substitutions is therefore an almost inexhaustible source of discoveries; it guides the hand of the chemist who confides in it, it remedies his faults by showing him the cause of them, and among a multitude of possible but uncertain reactions it points out some which are ready and easy to be produced, and are of the highest interest.

"The future—so rich in realizable facts—so full of accessible discoveries—which the law of substitutions opens to the view of chemists, justifies an expression of M. Ampère. When I was speaking to him of the law of substitutions, he at first confounded it with the reactions of ordinary equivalents; but when I had developed to him the still incomplete views which I then had deduced from it, he said to me,—'Ah! my friend! how I pity you; you have just found work for your whole life!' a prediction which would have been realized, had not so many elevated minds, taking up the law of substitutions, given it an impetus which renders my part of the work less necessary."

The new developement which M. Dumas has given to the theory of substitutions includes the substitution with the preservation of types as an inseparable condition. M. Dumas acknowledges two kinds of type, namely, the chemical and the molecular. It is difficult to decide, from his definitions, whether these two terms signify the same thing, or whether there is a difference in the signification, so that the same molecular type is not always the same chemical type: I will quote his definition:—

"I rank in the same kind, or, what amounts to the same thing, I consider as belonging to the same chemical type, bodies which contain the same number of equivalents united in the same manner, and which possess the same fundamental chemical properties."

M. Dumas has not explained how it must be ascertained whether the same number of equivalents are combined in the same manner, or whether they are combined in a different manner; as to that, he certainly has good reasons, for neither he nor any other chemist has the power of comparing the similar or dissimilar manners in which the same number of equivalents may combine in different compounds. Now, as this question includes the basis of the definition of chemical types, which can be only arbitrary, and which may be differently viewed by two different individuals, the whole idea rests on a basis impossible to be found. This circumstance, of itself, is sufficient to show to what point the ground on which this new theory rests is moving. Nothing so much tends to support what I have just been saying as the following experiment, made with the view of developing its fundamental principles:—

"The definition of the chemical type therefore carries along with it properties which I call fundamental. Now, by what means is a fundamental property recognised? This is a question to which it is easy to reply by examples which will appear conclusive.

"When chloracetic acid is boiled with an alkali, it is suddenly destroyed, and is converted into carbonic acid and chloroform. If we rank, as I have done, acetic acid and chloracetic acid in the same species, we are forced to conclude that acetic acid, treated by the alkalies, in its turn will be changed into carbonic acid gas, and carburetted hydrogen, corresponding to chloroform, into marsh-gas."

We have here then the definition of fundamental properties; but, on a nearer inspection, we shall see that it is simply reduced to an arithmetical axiom, namely: if equal quantities be taken from equal quantities, the remainder will be equal. Perhaps it is less difficult to explain than to define why he has given it the name of *fundamental property*.

M. Dumas has asserted, in his memoir on chloracetic acid, that it partakes with acetic acid the properties of having a very sour taste, of crystallizing, and of being volatilized without decomposition; whence he immediately draws the conclusion that when hydrogen in a body has been changed for chlorine, the chlorine acts in the new compound the part of the hydrogen, and that this new compound possesses, in general, the properties of the body which gave rise to it. M. Dumas on this occasion exults in the excellence of the power of prediction inherent to the theory of substitutions, by saying that the electro-chemical theory never could have produced any thing similar. I have shown by a comparison between the properties of the above acids that they are not more alike than any other two acids. M. Dumas then declared * that I had not taken a right view of his opinion, nor of what he meant by fundamental properties; that it signified that when two atoms of carbonic acid were removed from one of each of two hydrated acids, there remains in the two acids an equal number of elements, constituting by their union two combinations belonging to the same type: so that 2 at. of carbon, 2 at. of hydrogen, and 6 at. of chlorine, in all 8 at. of the two latter, remain from the chloracetic acid, and

* *Comptes Rendus de l'Académie des Sciences*, 1ere Semestre, p. 814.

produce chloroform, $C_2 H_2 Cl_6$, in the same manner as, with acetic acid, 2 at. of carbon and 8 at. of hydrogen give marsh gas, $C_2 H_8$. Moreover, in order that these two very different bodies, which have no point of resemblance beyond the number (10) of their elementary atoms, may be looked upon as belonging to the same chemical type. M. Dumas converts 2 at. of $C H_4$ into 1 at. of $C_2 H_8$, without having any other reasons for doubling the atomic weight than to sustain his doctrine, which otherwise must fall to the ground. It is therefore evident that, with respect to the question of chemical types, *the combination of atoms among themselves in a similar manner* is but a simple arbitrary supposition, which may be made in different manners by different persons, and that the positive point of fundamental properties rests only on a numerical relation; being of the same type, on the contrary, is only an arbitrary supposition.

If, on the other side, we make positive comparisons, if we eliminate the water of the two acids, and consider them in their combination with potassa, for example, in order that the theory of substitutions may have the slightest appearance of reality, the products of the destruction of bodies of the same type must be of the same type among themselves. We have seen chloracetate of potassa converted by hydrate of potassa, assisted by boiling, into carbonate of potassa and chloroform. But if you treat acetate of potassa in the same manner, the acetic acid remains unaltered. That seems to be a true fundamental property. An acetate submitted to dry distillation gives acetone. It is not yet known what chloracetate of potassa produces by dry distillation, but, in all probability, the product resembles acetone as little as carburetted hydrogen does perchloride of formyle. To obtain carburetted hydrogen from an acetate the latter must be heated, in the state of hydrate, in a distillatory apparatus, with three or four times its own weight of caustic baryta, and even then it is not obtained unless the salt or the base contains exactly one atom of water for each atom of acetate of potassa.

In order to illustrate what M. Dumas means by a chemical type, we may here give some examples which he himself gives, and in which I will write the formulæ, making use of the equivalents for the sake of greater simplicity:—

Formic acid	$C^2 H O^3$
Oxide of methyle	$C^2 O H^3$
Chloroform	$C^2 H Cl^3$
Carburet of hydrogen, at least	$C^2 H H^3$
	$C^2 H \left\{ \begin{matrix} H \\ Cl^2 \end{matrix} \right.$
Perchloride of carbon . . .	$C^2 Cl Cl^3$

These are combinations which contain the same number of equivalents, six in each case, and which contain 2 at. of carbon in the first term; the second term is composed of only one equivalent, which may be oxygen, hydrogen, or chlorine, according to which is best adapted to the object proposed. In the third term there are three equivalents, which may be either oxygen, hydrogen, or chlorine. If one single element be not sufficient for completing the third term, the latter may contain one or two equivalents of one or other element: we have given an example of this in the formula which is not preceded by any name. It is not by any means necessary that a type should contain *three* elements; it may contain two or four. The parts which the elements act in a combination do not depend on the nature of those elements, as we shall see farther on, but on their position in the combination. Thus, in the preceding example, the hydrogen of formic acid acts the same part as the oxygen in methylic acid, and the hydrogen of the latter the same as the oxygen in formic acid. So that oxide of methyle is no other than formic acid, or what the oxygen is in the one, the hydrogen is in the other, and *vice versâ*. Now, when a combination contains only two elements, then its atom is multiplied until the sum of its equivalents equals 6, as was done with marsh-gas. In the fourth formula, and in the perchloride of carbon in the last, the atoms are divided in order that there may be one equivalent in the second term, and the three others in the third. Thus the perchloride of carbon is formic acid, or oxide of methyle, the hydrogen of which is changed for chlorine: marsh-gas is formic acid, or oxide of methyle, whose oxygen has been replaced by hydrogen. But M. Dumas has omitted to indicate here the whole extent of the power of the theory of substitutions: we have seen that all the elements of an organic substance may be changed, even to the carbon: if, then, in $C^2 Cl Cl^3$ we replace the carbon by chlorine, we shall have $Cl^2 Cl Cl^3$, or, in other words, gaseous oxide of methyle, in which all the elements are replaced by chlorine.

On reflecting on the formation of molecular types, I at first thought it was only a *plaisanterie*, but M. Dumas took care to drive away every idea of that nature, by giving the manner in which the question must be looked at.

"It will be remarked how, in this long series of researches, the force of experiment has been gradually raised from an obscure corner of science to the most general ideas of natural philosophy."

I have long been curious to know M. Dumas's opinions with respect to organic radicals. It is well known that there was a scientific discussion between MM. Dumas

and Liebig, as to whether ether ought to be considered as the oxide of an organic radical, or indeed, as M. Dumas contended, a combination of 1 at. of etherine, $C^4 H^8$, with 1 at. of water. After an oral debate between these two distinguished chemists, they both adopted the first of these opinions, and M. Dumas, in their name, communicated to the Academy of Sciences an opinion concerning the composition of organic bodies, considered as containing compound radicals combined with oxygen, haloïd bodies, &c., &c. On this occasion M. Dumas asserted that he had been for ten years occupied in investigations the object of which was to develope this theory. It is to be regretted that he has not as yet communicated any of his researches to the learned world. Since the exposition made in concert with M. Liebig, M. Dumas has shown us nothing tending to extend our ideas concerning radical compounds. His works on the tartaric and citric acids, and on the theory of substitutions, have been of a nature to make us suspect that he was less satisfied with that opinion. On this occasion he also expressed himself in so vague a manner, that for my part I am at a loss to comprehend what he means by a compound or organic radical.

I will quote his own words.

"It is known that by organic radicals, we mean to designate compound bodies which may be functioned in the manner of simple bodies, and which, like them, and according to the same laws, enter into combination with the various bodies of nature. If, by organic radicals we would imply bodies analogous to cyanogen, amidogen, and to oxalic or benzoic radicals, no doubt they are, indeed, compound bodies which have the function of simple ones, like the analogous bodies in mineral chemistry—oxide of carbon, sulphurous acid, binoxide of azote, and nitrous vapor. But if, by organic radicals, as M. Berzelius wishes, we must designate certain invariable compounds which act the part of metals, the theory of types, quite admitting their concurrence, cannot admit their permanence.

"Thus, in order to fix the ideas, in the theory of types, the essence of bitter almonds is a type in which, for one equivalent of hydrogen, an equivalent of chlorine, of bromine, of iodine, of oxygen, or of amidogen, may be substituted, without the type being altered.

$$C^{14} H^6 O^2$$
$$C^{14} H^5 O^2 \quad Cl$$
$$C^{14} H^5 O^2 \quad O$$
$$C^{14} H^5 O^2 \quad S$$
$$C^{14} H^5 O^2 \quad NH$$

"But admitting that the system $C^{14} H^5 O^2$ may be replaced by an element, the theory of types does not regard it as an invariable group."

If now we have not any *eclaircissement* concerning what M. Dumas means by organic radicals, at least we have learned that in the theory of substitutions, the equivalent of hydrogen may be replaced by two equivalents of the same element, provided that an equivalent of nitrogen be added. The law of substitutions is indeed the product of a very *liberal*, I might almost say, *radical* legislation.

In order to make it felt that our present chemical nomenclature is inexplicable as regards organic combinations, M. Dumas proves that it is founded on a false system of dualism—on an antagonism in the nature of the bodies which combine—a herald of the electro-chemical system which was afterwards developed. According to the theory of substitutions, organic substances ought to be classed in types corresponding to genera, and in species, after the manner of natural history. He quotes for example: acetic acid, chloracetic acid, ether, chlorether, olefiant gas, and chlorolefiant gas. It would have been particularly instructive had he given the names which he has formed for the genera which we have seen above. M. Dumas is not so opposed, this once, to electro-chemical opinions, as he is in his memoir on the formation of chloracetic acid. It is now no longer necessary to be an adversary to the theory of substitutions to defend the electrical relations of elements. He acknowledges them. They may exert some influence at the moment when the combinations are formed and destroyed, but when once the elements are combined, nobody knows what part each element takes in the compound body. M. Dumas declares that he does not dispute *my* electro-chemical ideas. I have committed the error of suspecting that the nature of combinations depends on the nature of the elements; showing him, on the contrary, that the nature of the elements goes for nothing, and that the influence of the elements on the properties of combinations depends only on their position. Such is, according to him, the difference between our opinions. As the question concerning the position of elements might not seem very clear, since nobody can see how they are placed, M. Dumas has given the following example:—

Oxide of ethyle $C^4 H^5 O$. } Oxide of methyle $C^2 H^3 O$.

Acetic acid $C^4 H^3 O. O^2$. } Formic acid $C^2 H O. O^2$.

Acetic acid, therefore, is oxide of ethyle, and formic acid, oxide of methyle, in which two atoms of oxygen are placed like hydrogen, which signifies that they act like hy-

drogen. This position then is so clear as to preclude the possibility of mistake. We have above seen that formic acid is $C^2 H O^3$, and oxide of methyle $C^2 O H^3$; the position of the elements is therefore variable according to circumstances, without any change in the properties of the body constituted by their combination, and that again according to the theory of substitutions, it certainly is very convenient, and renders the theory very much more *manageable*. It is much to be regretted that the properties which depend on the position of the elements do not allow themselves to be *managed* like the position of the atoms in the formulæ. The only objection which can be made to this mode of demonstration is, that these are only formulæ, and indeed very arbitrary ones; but the theory of substitutions considers objections of this nature as valueless.

This doctrine has not met with general approbation, either in the Academy of Sciences at Paris, or out of it. The older French chemists have not thought the thing worth the trouble of their speaking about, so that young chemists only have accepted the defiance.

M. Pelouze has made objections to the theory of substitutions, as laid down in the Memoir on chloracetic acid, which are founded on experiments, and which have given rise to the Memoir of which I have been speaking. He has shown by experiment that the decomposition of aqueous acetate of soda by caustic of baryta, with the production of $C H^4$, is a general property of all bodies composed of carburetted hydrogen and oxygen, such as acetic acid, formic acid, alcohol, and many others, and that it is by no means a product of decomposition proper to acetic acid alone.

He has proved, besides, that in using hydrate of baryta for this decomposition, we obtain, as may easily be understood, nothing but pure hydrogen, instead of carburetted hydrogen, provided that the water in the hydrate is sufficient. The preceding fact, therefore, does not support the theory of substitutions and its types. The great number of substitutions of which this theory boasts, are nothing but ordinary exchanges of equivalents, like all those which take place between the elements of bodies in reciprocal changes, without our being enabled to foretel when the substitution will take place, and when it will not, without any connexion with the types which M. Dumas proposes, and in which the number of atoms may be arbitrarily doubled, as in the example where he substitutes $C^2 H^6$ for $C H^4$: there exists no positive character in support of the preservation of types: all is hypothesis, and M. Pelouze, in my opinion, has taken a very correct view of the subject.

M. Persoz has claimed, as one of his discoveries, the formation of $C H^4$ in the decomposition of the acetate of potassa by dry distillation with an equal atomic weight of hydrate of potassa. He has shown that acetone, in the nascent state, is decomposed by the water of the hydrate of potassa whose hydrogen and oxygen enter into new combinations, into carbonic acid which combines with the base, and $C H^4$ which escapes in the state of gas. According to my opinion, it is not the substitutions, but the *theory* of substitutions which should be rejected.

MM. Laurent and Baudrimont have made reclamations of priority. The mention of these reclamations belongs rather to the history than to a relation of the progress of science: so I shall pass them by in silence. M. Laurent has for some years defended the theory of substitutions, in the same manner as M. Dumas has since done. M. Baudrimont rejects the theory of substitutions, and looks upon the substitution only as a simple exchange of equivalents.

M. Gerhard has made an attempt with the view of proving according to M. Dumas' law of substitutions, the manner in which organic bodies combine with oxides and inorganic acids. There are two kinds of combinations:—1st. Those in which the oxide loses its capacity of saturation, such as sulpho-benzide, nitro-benzide, &c., &c. They belong to the type benzine=$C^{12} H^6$, sulpho-benzide is $C^{12} \overset{H^5}{S} O^2$, and nitro-benzide $C^{12} \overset{H^5}{N} O^4$; in the first, one equivalent of hydrogen is replaced by an equivalent of sulphurous acid, and in the second, by an equivalent of nitrous vapor. 2dly. Those in which the oxide or inorganic acid retains its capacity of saturation, in which there is no substitution, but in which the inorganic acid is combined with the organic body in a new manner, which may be called the *coupling* (*accouplement*) of the organic body, the latter taking the name of *couple* (*copule*). When it happens that a part of the acid loses its capacity of saturation, there is at the same time a substitution and *coupling*, in sulpho-benzoic acid $C^{14} H^4 S^2 O^7$, for example. It is composed of one atom of benzoic, and one atom of sulphuric acid, which saturate one atom of base each, separately; but in this benzoic acid one equivalent of hydrogen is replaced by an equivalent of sulphurous acid=$C^{14} \overset{H^5}{\ddot{S}} O^3$.*

* I have shown in the report of 1839, p. 390, that this acid is $C^{14} H^6 O^2 + 2 \dot{H} \ddot{S}$, and in the present report I shall have occasion to speak of benzoic acid, which, under the

We have therefore seen "this future,—so rich in realizable facts,—so full of accessible discoveries, which the theory of substitutions has opened to our view."

ON THE RELATION OF FORM TO CHEMICAL COMPOSITION.*

BY DR. SCHAFHAEUTL.

In a former paper Dr. S. had given a new mode of obtaining graphite, in which it was also shown that all graphites owed their origin to the operation of the same causes; namely, the contact of bitumen, or any similar substance, with a silicate, under a certain limited degree of heat; it was further maintained, that the compound nature of graphite might be satisfactorily shown, by subjecting it to the action of hydro-fluoric acid, which, combining with the silicon, set free the carbon of the graphite as a hydruret, which was then consumed in the flame of a lamp. The object of the paper read on the present occasion was to explain the circumstances under which certain modifications of form take place in this peculiar substance, (as also in others generally considered elementary,) and to demonstrate their connexion with changes of an entirely chemical nature.

A beautiful specimen of a formation of graphite, obtained from the Neath Abbey iron-works, in South Wales, was exhibited to the Section; it seemed to be composed of an infinite number of foliated scales overlapping each other, like the slates of a roof; each scale being so thin, as to be agitated by the slightest breath of air: a second specimen was exhibited of a graphite leaf, where it appeared as a globule of much greater size, the laminated structure still existing in beautiful developement. In a third stage, the scaly structure disappeared: the globule having assumed a more porous and coke-like form. Dr. S., after objecting to any explanation of these curious changes of form, founded merely on molecular alterations, proceeded to detail certain experiments, from which he deduced conclusions of an interesting and important nature.

The discovery of a new method of decomposing crystallized graphite, by heating it in concentrated boiling sulphuric acid, and adding a little concentrated nitric acid, afforded a series of singular and instructive phenomena. After the evolution of binoxide of nitrogen had ceased, each scale of graphite was converted into the globular substance before described; its external metallic lustre remaining unimpaired, but its bulk so greatly enlarged, that what before appeared a single scale, became, by the separation and division of its component laminæ, a thick spongy tissue, capable of being restored to its former compressed foliated form, by pressure with the finger nail. That this change of form, however, was not merely a mechanical effect, appears from the following experiment:—

Graphite scales having been repeatedly treated with muriatic acid, washed, and again digested in a strong solution of caustic potash—in order to remove all possible mechanical admixtures of iron, silica and alumina—were then submitted to the process above described; the evolution of nitrous gas having ceased, an equal quantity of water was added to the mixture; immediately there succeeded a rapid evolution of bubbles from the globules of graphite, which at first lay at the bottom of the fluid; becoming lighter, as this evolution of bubbles proceeded, they gradually rose to the surface, when the gas immediately ceased to be evolved; the acid or the graphite must have been combined with hyponitrous acid, which, being decomposed by the water, was liberated as nitrous gas.

The globules when washed, dried, and weighed (at first weighing but 2·01 grs.), had increased in weight 5·02 grs. Being then put into a flat covered dish of brass, and accurately weighed, the cover was removed, the globules immediately lost weight, and so rapidly, that in removing them from the dish, 0·18 grs. were lost; the dish was covered with a dew, apparently of an acid nature, as it acted on the brass. These globules, heated on paper until it became slightly tinged with yellow by the heat, now disengaged dense fumes, the paper being streaked with a blackish coloured smoke where it was in contact with the graphite; 2·30 grs. were lost during this process, which being repeated a second time, they were found to have lost 2·25 more. Finally ignited in a platinum crucible, dense fumes, without any perceptible odour, were given off, the weight of the globules being reduced to 1·86 grs. After which, no further reduction took place during ignition for half an hour in the open air. The total loss of the 2 grains thus experimented upon with the acid, was 6·96. In a former paper by Dr. Schafhaeutl, this loss was attributed to disengagement of carbonic acid gas during this conjoined action of the acids; but it would appear from the last experiment, that there

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influence of nitric acid, gives rise to a combination corresponding to $C^{14} H^{8} O^{2} + H \overset{\cdot\cdot}{N}$, but which saturates only one atom of base.

* *British Association:* Glasgow meeting, Sept. 1840. From the Report given in *The Athenæum.*

is formed a compound of sulphuric acid, nitric acid, carbon, hydrogen and oxygen, volatilizable only at high temperatures.

The question here arises, how can this rapid loss of weight be accounted for? During the previous drying process, which was conducted at 212°, the loss of water must have been accompanied by a change of chemical composition, and the new compound, by attracting water or oxygen when in the pan, must have formed an exceedingly volatile combination, evaporating as rapidly as it was formed.

By a repetition of this treatment with the acid, graphite in the third stage, as before described, was obtained; the metallic lustre was entirely destroyed, as also was the laminated structure; it now appeared as a porous mass, resembling coke, and no longer capable of reduction to its original foliated state by pressure, having undergone a decided chemical change. The acid solution deposited at once a copious precipitate of silica and alumina, slightly tinged by oxide of iron, on the addition of sufficient ammonia to neutralize it. A similar precipitate was obtained from the acid of the first experiments, but less in quantity, and requiring a longer time for its operation.

Thus it would appear that the abstraction of silicon and the change of physical properties of graphite, are corresponding and mutually connected phenomena.

In further proof of the necessary connexion of silicon as a chemical combination, essential to the existence of the scaly metallic lustre of graphite, it will be found that by repeating the same experiments, the globules ultimately disappear, and the remaining solution in acid neutralized by ammonia, deposits only flaky silica, with traces of oxide of iron. On attentively observing the specimen of graphite, as found in its natural state, and comparing it with those treated with acids and alkalies, also exhibited, it appeared that the scales, before being operated on, had a dirty greyish appearance, described as owing to their being covered with spots, consisting of microscopic six-sided flattened prisms of silicate of iron; the matrix of this graphite formation, in the blast-furnace cinder, essentially composed of bisilicate of lime and alumina, deriving a yellowish tint from a slight admixture of sulphuret of calcium, with a trace of sulphuret of potassium. Scales of very different density may be separated, the thinnest not affected by the magnet, the thicker ones decidedly so; those in the middle of the mass, thicker and stiffer, not easily broken, and showing a shining black fracture, like that of anthracite, form a variety of graphite, in which silicon and iron greatly predominate, developing, when treated with hydrochloric acid, a fetid hydrogen characteristic of cast iron, and separating at the same time yellow flocks of silica and alumina.

Dr. Shafhaeutl then proceeded to indicate an analogy between the formation of grey iron in the blast-furnace, and that of graphite; namely, that the same chemical conditions occur during the change of white iron into grey; this takes place after having descended through the furnace, and reached the stratum of slag covering the melted metal; this slag being an earthy bisilicate (in coke furnaces, approaching to a trisilicate), and containing a small quantity of protoxide of iron. As silicon is found in graphite only in very small quantity, it has been considered an accidental impurity, just as the small quantity of hydrogen retained by charcoal, sulphur, &c. has been considered as impurity; but as these foreign matters can be separated by no chemical means, without destroying the state in which graphite, charcoal, and sulphur exist, it must necessarily be inferred that such admixture is essential to their existence in that state in which they ordinarily occur.

Quitting the individual consideration of graphite, the author extended the principle here argued to certain other substances, generally considered as simple bodies. For example, sulphur obtained by the decomposition of sulphurets by acids, is white in colour, and invariably combined with a stable quantity of hydrogen. But obtained from hyposulphites, it is as invariably yellow, and the presence of free hydrogen in the slightest quantity, bleaches the precipitate.

The known case of sulphur precipitated under the presence of sulphuretted hydrogen, and cautiously mixed with metallic copper in its utmost state of minute division, being found to combine directly, evolving a dull red heat, has been considered an exception to the law, that no two dry bodies unite without the intervention of a third; but sulphur precipitated from hyposulphites, will not thus combine, nor will pure sulphur, though subjected to the minutest division possible. The same sulphur, however, brought in contact with hydrogen, under a pressure of four atmospheres, and then quickly mixed, is found to combine, as in the first instance, but if exposed to the air, its power of combination is again lost; thus, a third body is proved necessary here, as in all cases. And further, the author doubted if one of the two different crystalline forms of sulphur is not owing to the presence of hydrogen, which he found to be in combination with it in a very perceptible quantity.

These peculiar forms of combination, where a few atoms of one body are combined with many atoms of another, may perhaps be considered as forming a class of

compounds intermediate between the inorganic and the higher organic compounds: thus, the compounds of arsenic acid form a very striking example. In the subarseniate of iron, 50 atoms of iron are combined with only 3 atoms of arsenic acid and 75 of hydrogen. So again, 24 atoms of arsenic with 1 atom of sulphuret of potash in sulpho-arseniate of potassa. By gradually passing from compounds of inorganic chemistry to those of organic chemistry, we find diacetate of copper with water, 48 atoms of oxide of copper combined with only 1 atom of hydrogen and 12 atoms of water. And finally, in the field of organic chemistry itself, we have, for example, margaric acid, composed of 67 atoms of hydrogen, 35 carbon, and 3 of oxygen only. In oleic acid, 120 atoms of hydrogen are combined with 70 of carbon and 5 of oxygen; in stearic acid, 134 atoms of hydrogen with 70 of carbon and 5 of oxygen, &c. The author formerly hinted that the principal circumstance which tended to produce compounds of such multiplicity of atoms, or, in fact, organic compounds, was the separation of the particles of bodies brought into action by the capillary powers of the vessels of organic structures. It was probable that the chemical action of these separated molecules must be a different one from their action, when arranged into one definite form; and as a proof that once received laws of affinity were exhibited only under peculiar circumstances, he directed the attention of the Section to H. Rose's compound, formed by the direct combination of 29·97 per cent. of ammonia with 70·03 per cent. of sulphuric acid, which ought to have produced anhydrous sulphate of oxide; but after combination, neither sulphuric acid nor ammonium could be detected in the compound. The same chemist found combinations of anhydrous sulphuric acid with the chlorides of ammonium, potassium, sodium, and the nitrate of potassa.

According to the laws of affinity, for example, in the last case, the nitric acid ought to have been displaced, decomposed, and driven away by the more powerful action of sulphuric acid; but no tendency to the displacement of chlorine or nitric acid was shown, and new compounds, different from all hitherto known, resulted. As no combination of anhydrous sulphuric acid took place with oxide of calcium, chloride of barium, or chloride of copper, he concluded, that these above-mentioned combinations were formed by replacing one double atom of hydrogen, water, or chlorine, in order to form a bisulphate of potash, soda, or ammonia.

Dr. S. seemed to believe, that there existed two different states of chemical combination; the first in which the chemical forces of molecular attraction were acting only according to the relative quantities of matter; the second, where, under the always catalytic presence of a third, the elementary substances arranged themselves, separating in groups according to the resultant electric forces of the centres of action created by the above-mentioned presence of a third, acting differently on the different molecules of bodies in contact, in a somewhat similar way to a solution, which does not crystallize unless the molecular equilibrium of the liquid is disturbed. The first state of chemical combination might, perhaps, have some distant relation to Dumas's law of types; the second state,—a mere consequence of the first,—would be represented by Berzelius's electro-chemical combination.

The author, at the same time, referred to Prof. Graham's admirable papers, in which the Professor had so distinctly pointed out the great and *peculiar* part which matter performs in solid chemical combinations, and remarked, that during all chemical combinations where a third body is separated, the precipitation would take place only when a certain quantity of water was combined with the body to be precipitated, which water separated in the relation to the separation and consolidation of the precipitate only, and could be driven away from it only by applying a red heat.

NEW METHOD OF PREPARING MORPHIA AND ITS SALTS.*

BY DR. MOHR, OF COBLENTZ.

The plan adopted by Dr. M. for separating morphia from narcotine and all other heterogeneous substances, consists in dissolving it in an excess of caustic lime, and precipitating it by muriate of ammonia. This method of precipitation is, in principle, very similar to that of alumina, from a solution in caustic potash. The process is as follows:—

The opium is boiled in water, in which it readily dissolves; the decoction is strained through linen, and the dregs are pressed; this operation of boiling and straining is repeated twice on the same quantity of opium, and the solution of the whole is concentrated until its weight amounts to four times that of the opium employed. While still warm, the concentrated solution is mixed with milk of lime, prepared with a quantity of dry lime, equal to one-fourth of the weight of the opium. The mixture is heated until it boils, and is strained while hot. The fil-

* Read to the Chemical Section of the *British Association*.—From *The Athenæum*.

tered liquor has a light brown yellow color. While hot it is mixed with pulverized sal ammoniac in excess; the lime is saturated with muriatic acid, ammonia is set free, and the morphia is precipitated. When the solution is greatly concentrated, the precipitation is immediate, and almost equal in volume to half the solution. When, however, the solution is less concentrated, there is at first no precipitation, but as the liquor cools, open needles appear, and at a certain period a large mass of precipitate is suddenly formed.

The peculiarity of this process is, that it affords a well crystallized and fine product of morphia, without requiring the use of alcohol. This is owing to the circumstance that the ammonia is not added in a free state, but is generated in immediate contact with the substance to be acted upon. The morphia is nearly colorless; by dissolving it in muriatic acid, and subjecting the solution to crystallization, we obtain muriate of morphia in perfectly white and quite pure crystals. It is to be observed, that the milk of lime must not be added to a boiling hot solution of crude opium, otherwise the precipitate adheres to the sides of the vessel, and does not afterwards perfectly re-dissolve. The liquor containing the morphia should be either cold or only luke warm when the milk of lime is added to it. If it is boiling hot it must be added to the milk of lime, and not *vice versâ*.

Dr. Gregory observed, that this was an excellent method of preparing morphia on the small scale and for class-room experiments, and complimented the author on his knowledge of the English language, in which the paper was written.

ON THE FORMATION AND PREPARATION OF BLUE OXIDE OF TITANIUM IN THE DRY WAY, AND ON THE CAUSE OF THE BLUE COLOR OF MANY SCORIÆ FROM HIGH FURNACES.*

BY CH. KERSTEN, OF FREIBERG.

Far advanced as is our knowledge concerning the composition and properties of titanic acid, our acquaintance with the blue body which zinc, iron, and tin produce in solutions of titanium is proportionately scanty; it is for the most part reduced to simple conjecture. Mr. Kersten has made many experiments on this subject, which have demonstrated that titanium may be presented at a lower degree of oxidation than that of titanic acid, and that the blue body, which, hitherto, could be prepared only by the humid way, and whose existence was still problematic, may be obtained in the dry way. This body is produced in several ways:—

1st, By passing vapors of zinc over titanic acid heated to whiteness. This acid then acquires a dirty blue color, but it loses it and again becomes white, when put in contact with oxygen at a high temperature.

2nd, By putting in a porcelain crucible metallic zinc, or oxide of zinc, mixed with charcoal, then covering the whole with titanic acid or a titaniferous earthy silicate, and heating the crucible, which must be well closed for several hours at a red heat. Thus will be obtained melted masses of a lavender color; they are opaque, and contain, besides oxide of zinc, blue oxide of titanium.

3rd, By fusing at a white heat, and out of contact of the air, various titaniferous combinations; for example, the titaniferous silicates of lime and alumina with iron. These silicates, which at first are colorless, become more or less blue.

4th, By treating the same titaniferous silicate, in the same manner, with metallic tin. A small addition of charcoal seems to facilitate the formation of the blue glass.

5th, M. Kersten has found that titanic acid may be reduced, under certain circumstances, by means of hydrogen, to the state of blue oxide of a very fine color. If very fine titanic acid be added to bi-phosphate of soda in a state of fusion, in a porcelain crucible, it is very easily dissolved at a gentle heat, and a white transparent mass results. If this mass be introduced into a bowl made of not very fusible glass, and heated to a high temperature, and if hydrogen dried by means of chloride of calcium, be driven into it, the saline mass very soon acquires at the surface a beautiful lavender color. If the residue be afterwards digested in water, the phosphate is dissolved, and blue oxide of titanium remains. A portion of this oxide was exposed to the air for two months, without losing its fine blue color. Oxide of titanium, thus prepared, is unalterable in the air, at the ordinary temperature; but, heated to redness in contact with the air, or oxygen, it is converted into a white powder—titanic acid. At the ordinary temperature this blue compound is not acted on by hydrochloric acid; but, heated with it, it loses its color, and is converted into titanic acid. Zinc, tin, and iron, steeped in this liquor, reproduces the blue oxide.

6th, If pure zinc be placed at the bottom of a porcelain crucible, and then covered with a mixture of titanic acid and biphosphate of soda, or, what is still better, the result of the fusion of these two substances, and if the crucible be strongly heated for several hours, a blue, or sometimes violet, saline mass is obtained, which readily dissolves in

* *Annalen der Physik und Chemie*, vol. xlix. p. 231.

water, leaving the blue body as a residue, mixed with a little oxide of zinc, which was not dissolved in the alkaline phosphate.

7th, If, instead of zinc, tin or iron be employed, the results are the same.

By the two last methods, however, the oxide obtained is less pure and of a less beautiful color than when titanic acid is reduced by means of hydrogen.

As in analyzing the various blue scoriæ of iron, coming from different countries, the author had found small quantities of titanic acid, and as these scoriæ had a color similar to that of the blue oxide prepared in the dry way, he presumed that this color, instead of arising from the protoxides of iron or manganese, which are sometimes found in these scoriæ, proceeded from titanic acid. From the above facts, it is very probable that titanic acid, which is very frequently met with in iron mines, after having been dissolved and reduced to scoriæ during the smelting, was afterwards reduced to the state of oxide by the liquid iron, as occurs in the humid way in solutions, and in many of the foregoing experiments. If this presumption be true, we should be able, with the substances ordinarily contained in the scoriæ and titanic acid, to reproduce blue glass. The following up of this idea, carried on with perseverance, has given very good results. M. Kersten has not only succeeded in fusing together silica, lime, alumina, titanic acid, and iron, all pure, producing blue glasses, and which entirely resemble many blue scoriæ of iron, but he has also been able to obtain it with the same earths, titanic acid and zinc deprived of iron, or pure tin. He concludes, therefore, with the conviction, from all his investigations, that the blue coloring matter of many iron scoriæ is blue oxide of titanium.

The author has endeavoured to make use of this blue oxide for producing colors on porcelain; and if they do not possess all the beauty of those of cobalt, they come nearer to it than any other blues.

NEW COMPOUND OF ARSENIOUS AND SULPHURIC ACIDS.*

BY DR. SCHAFHAEUTL.

This was obtained from the smoke of copper calcining furnaces near Swansea, in South Wales. The new compound was another singular instance of an anhydrous crystallized body being deposited under the presence of water only, and was a remarkable proof of the unlimited number of different forms of combination, which might be produced even in inorganic nature, by bringing chemical substances in contact under various circumstances.

The copper ores smelted in South Wales, are for the greatest part copper pyrites, mixed with iron pyrites, grey copper ore, &c.; in fact, a mixture in which the sulphurets of copper, iron, arsenic, antimony, cobalt, nickel, zinc, and tin, were invariably found together. Sulphur and arsenic escape from these ores during the calcining process, as sulphurous and arsenious acids, and have been found to destroy all vegetation for miles round the copper works, without affecting animal life in the slightest degree. By bringing the escaping fumes in contact with steam, and driving it through burning charcoal, or subjecting it only to a great pressure in contact with steam, the new solid compound was deposited on the cool surfaces of the chambers connected with the calcining furnace. It was deposited in beautiful crystallized leaves or tables, perhaps belonging to the same class as Wöhler's dimorphous modification of the crystallization of arsenious acid, the regular form of which belongs to the octahedron.

It was found to consist, in 100 parts, of:—

Arsenious acid	68·250
Sulphuric acid	27·643
Protoxide of iron	3·029
Oxide of copper	0·420
Oxide of nickel	0·656
	99·998

Corresponding to

Metallic arsenic	51·741
Sulphur	11·095
Iron	2·339
Copper	0·336
Nickel	0·516
Oxygen	33·971
	99·998

These crystals attract moisture from the air with great rapidity and with evolution of heat, corroding animal and vegetable substances as powerfully as concentrated sulphuric acid. Their taste is pure, but extremely sour, similar to sulphuric acid, and, when dissolved in water, the remainder of 100 parts of these crystals was only 17·436 grains. The shape of the crystals was perfectly retained, only their appearance was changed from transparent into opaque. Their chemical composition was found to be:—

Arsenious acid	16·778 grs.
Oxide of nickel	0·656
	17·434

* *British Association:* Glasgow, 1840.

What the water had dissolved consisted of:—

Arsenious acid	51·472
Sulphuric acid	27·643
Protoxide of iron	3·029
Oxide of copper	0·420
	82·564 grs.

One of the remarkable changes which occurred during the formation of this compound, was the conversion of sulphurous into sulphuric acid, as well as the presence of iron, copper, and nickel, in a deposit from gaseous matter. No other definite compound of arsenic acid with another acid seems to be known, except those with the organic tartaric and paratartaric acids.

ACTION OF AIR AND WATER ON IRON.*

BY MR. MALLET.

Mr. Mallet stated in a general manner the nature of the principal practical results which he has obtained, with respect to the durability and modes of protecting cast and wrought iron, or steel, under various conditions, when exposed to the corrosive or chemical action of air and water, whether fresh or salt. These researches have been made under the sanction of the Association, and are still in progress. Numerical results have already been obtained (*Athen.* Nos. 566-8) of the absolute and relative durabilities of about one hundred varieties of cast iron and wrought iron, in each of the following conditions as to water, viz.:—

In clear sea or ocean water; in foul sea water, as in the harbours of large cities; in clear river water; in foul river water; in sea water at high temperatures; in sea water at various depths; in sea water of variable saltness. The results in all these cases are given in voluminous tables, arranged in such a manner as to enable the engineer to predict with confidence the durability of a given scantling of iron of a given sort, under given circumstances.

The conditions of corrosion of iron, in contact with copper, with zinc, and with tin, and with various atomic alloys of these, have been determined, and printed tables of the results distributed to the Section. Results are also given as to the relative protecting power of several paints or varnishes, to the surface of iron exposed as above The specific gravities of all the irons experimented on, have been taken by a new method, and the increment of specific gravity due to increased depth (or head of metal) in castings determined, and also the decrement of specific gravity due to increased bulk or scantling of castings determined.

These are necessary data to the foregoing investigation, and are in themselves of importance to the engineer, with reference to the ultimate cohesion of cast iron, which seems to be related, and probably is some function of the specific gravity in any given case. The experiments are now extended to wrought iron and steel; a final report is proposed, to consider the nature of the chemical changes induced on cast and wrought iron by the action of sea water, and to complete the numerical results now given, which have lately been in several instances submitted to control, or tested by the actual corrosion of castings recovered from the wrecks of the *Edgar* and *Royal George*, &c. and found strikingly to coincide.

ON THE COMPOUND, OR RADICAL CALLED KAKODYL.†

BY PROFESSOR BUNSEN, OF MARBURG.

The object of this paper was to describe a new radical resembling alcohol, in which arsenic replaced the oxygen of that compound. This radical enters into numerous combinations, forming, with oxygen, a peculiar acid called kakodylic acid. The oxide of kakodyl has so great an affinity for oxygen, that when exposed to the air it immediately inflames. The bodies produced by the combustion are arsenious acid, carbonic acid, and water. By the further oxidation of the oxide of kakodyl, kakodylic acid is produced. The sulphuret of kakodyl is similar in composition to the oxide, and participates in many of its properties. The telluret, seleniuret, iodide and bromide of kakodyl were also examined. The danger attending these experiments is very great, and the poisonous effects produced by the inhalation of the vapour were described as dreadful. Kakodyl is produced from the liquor of cadet, and is extremely interesting as being a link connecting organic and inorganic chemistry. Professor Bunsen is engaged in further experiments on this subject, and has already obtained many new combinations.

* *British Association*; from *The Athenæum*, in which journal our readers will find very full reports of all the papers read to the various Sections of the Association, at the Glasgow Meeting.

† Read to the Chemical section of the *British Association*.

INVESTIGATIONS CONCERNING SULPHURET OF CARBON.*

BY M. COUERBE.

From the numerous experiments and analyses detailed in this memoir, it results:—

1st. That the xanthates of potassa and lead act differently when exposed to the action of heat; while xanthate of potassa gives a mixture of polysulphuret of potassium and carbon, xanthate of lead gives a residue of simple sulphuret and traces of carbon, about two per cent.

2nd. That xanthate of lead, a compound of ether, oxide of lead, and sulphuret of carbon, may be dissolved in hot alcohol, and may be crystallized in this vehicle.

HEDERINE, A NEW ACTIVE PRINCIPLE.†

BY MM. VANDAMME AND CHEVALLIER.

In the seeds of the ground ivy there exists an alkaline matter for which the above chemists last year proposed the name of *hederine*.

This substance is exceedingly bitter, and it seemed to MM. V. and C. that it might be used with quinine or its sulphate, on account of its febrifuge property, in addition to the advantage of being indigenous, like salicine.

Hederine is found in the seed of the *hedera helix*, and seems to exist therein in the state of a per-malate. Its mode of separation is the same as that of other vegetable alkalies; it consists in treating the alkaline precipitate of hederine produced by hydrate of lime, by boiling alcohol, afterwards evaporating the liquor, &c.

ON BELLADONNINE.‡

BY M. F. LÜBEKIND.

M. Braudes has already shown by his experiments that the leaves of the *atropa belladonna* contain two new organic bases; one of which is solid and crystallizable, the other volatile, having a great analogy to ammonia. M. Braudes had there rested from his work, when M. Lübekind resumed it under the direction of Professor Löwig. He took 36 pounds of the dried leaves of belladonna, which he distilled in a tin alembic, with 12 quarts of caustic potassa, adding chloride of platinum, drop by drop, to the product of this distillation;§ instead of a powder in grains, crystallizable and octohedral, a white, uncrystallized precipitate was obtained, which was readily soluble in ammonia. This white precipitate was mixed with two parts of pure and dry carbonate of potassa; this mixture is introduced into a retort, and gently heated. It suddenly acquires a blackish color, and carbonic acid is disengaged, while, in the upper part and neck of the retort, a white substance is sublimed: this is pure belladonnine. In the gas which was disengaged, hydro-chloric acid was perceptible, only to smell, although no chloride was found in the sublimed matter, even when exposed for some hours in a place heated to from 35° to 40 Cels.

Belladonnine occurs in colorless, transparent crystals. A great number of experiments showed M. Lübekind that it does not contain sulphur. Burnt with a mixture of potassa and nitrate of potassa, it disengages a gas of a very pungent odour, which did not exert any action on nitrate of silver, which distinguished it from ammonia; that alkali producing, with nitrate of silver, a yellow precipitate, resoluble in the precipitant.

Belladonnine has a very great resemblance in its smell to volatile alkali. It is not very poisonous: taken fasting, in the dose of two grains and a half, it caused only a burning in the throat, which disappeared after breakfast. This alkaloïd entirely dissolves in water, and then exerts an alkaline reaction, which is not stopped by heat, as with ammonia: it neutralises the acids, and forms a series of salts. The analysis of this substance, made by means of Mitscherlich's apparatus, gives carbon, nitrogen, hydrogen, and oxygen, the proportions of which will be made known at a future opportunity.

Löwig looks upon this base as being formed of two compound bodies: this opinion is founded on the fact of its being decomposed by nitric acid, with a swelling up, owing to the great liberation of carbonic acid. In all the experiments to which it has been submitted, it appears to contain nitric acid. If this substance be heated, it fuses, with a disengagement of ammonia and nitrogen; there remains a white residue which is difficultly volatalised in yellow crystals, and an odour resembling that of cyanogen is perceived; by treating it with hydrate of lime, there is no ammonia given off. Hydro-chloric acid exerts a similar action on it, which gives rise to another yellow substance which crystallizes in rhomboids: it has an acid taste, and burns with a flame, when melted in a glass tube. A

* *Comptes Rendus*, No. 11, September 14, 1840.

† *Journal de Chimie Médicale*, October, 1840.

‡ *Dall' Archiv. der Pharmacie.*

§ *Annuavio delle scienze chimiche pharmaceutiche.*

solution of nitrate of silver did not produce any precipitate in this singular combination. Neither lime nor potassa developed ammonia in it; the strong odour of that gas was not perceived when this substance was melted with caustic ammonia.

VEGETABLE CHEMISTRY.—EXTRACTION OF THE YELLOW COLOR OF THE CALENDULA OFFICINALIS (GARDEN MARYGOLD).

To the Editors of The Chemist.

GENTLEMEN,—It would be a very desirable thing to many of your readers if vegetable chemistry more frequently adorned your pages; for this is a department of science in which interesting experiments are easily made; indeed, it can never be known what good would accrue to medicine, domestic use, and the arts, if the hidden treasures of the vegetable kingdom were properly investigated and brought to light. Such investigations can never be accomplished by analytical chemistry, by which method the elementary constituents of vegetables are found out at the cost of their destruction; for by this destructive process, every vegetable may be reduced to the same elements, though differing in their combination. It is very probable that the atomic system (though in its own place it is the perfection of chemical knowledge), yet it will never teach us *a priori*, the effect of any combination of elements; but if it did that we could at once tell what to expect from every substance after it is once perfectly analyzed; but such is the obscurity that hangs over all the operations of nature, that we can only account for effects by experience.

A few weeks back I took some of the petals of the *calendula officinalis*, or garden marygold, for the purpose of trying what would extract their yellow color; but experiments proved to me that neither water nor spirit of wine would; however, I have found that oil of turpentine will readily do so.

Little experiments of this description ought to teach us the importance of Lord Bacon's method of induction, when contrasted with the Aristotelian mode of idle reasoning. What a wide field presents itself in the province of natural history for the lover of truth to exercise his talents and his spare time.

I am,
Gentlemen,
Your obedient Servant,
CORVENIUS.

Corwen, North Wales,
Nov. 10, 1840.

THE IRISCOPE.*

BY DR. READE.

Dr. Reade exhibited an experiment, with an instrument which he called an Iriscope. A piece of black polished glass was rubbed over in part with a solution of Castile soap: as soon as it was dry, the soap was polished off with a glove, until, as far as appearances were concerned, the one part of the glass was as clean as the other. He then blew his breath on the plate through a tube about half an inch in bore, and instantly the most vivid rings of colours (resembling Nobili's) were exhibited where the breath condensed on the part of the glass which had been previously soaped; while, on the other part, the condensed breath exhibited simply the usual dead grey colour.

CONSTITUTION AND PRODUCTS OF THE DISTILLATION OF FAT BODIES.†

BY PROF. REDTENBACHER AND DR. VARRENTRAPP.

The object of this paper was to show that the composition of the fat acids has hitherto been erroneously stated. A variety of acids were subjected to examination, such as stearic, margaric, oleic, and sebacic acid. Margaric and stearic acids were shown to possess the same radical,—the former being the higher, the latter the lower oxide of it. This radical has the formula of C_{34} H_{33}, and may be represented by the symbol $\overline{Ma}$: thus stearic acid is $2\,\overline{Ma}+5\,O$; whilst margaric acid is $1\,\overline{Ma}+3\,O$. They thus resemble sulphuric and hyposulphuric acids. Margaric acid is one of the products of the distillation of stearic acid; the oxidation of the latter also causes the formation of the former. Oleic acid was analyzed by these gentlemen, having been obtained in a pure state. The results were principally numerical, and are stated in Liebig's Journal for last July or August, to which we refer for further details regarding this communication.

* *British Association.*

† Read to the Chemical section of the British Association for the advancement of Science.

FRENCH MEASURES OF WEIGHT AND CAPACITY.

COMPUTED BY DR. URE.

At the request of several correspondents, we give the following table, from Dr. Ure's Dictionary :—

I.—Measures of Weight.

		English Grains.		Avoirdupois.
Milligramme	=	·0154		
Centigramme	=	·1543		
Decigramme	=	1·5433		
Gramme	=	15·4330		Pound.
Decagramme	=	154·3300	=	0·022
Hecatogramme	=	1543·3300	=	0·220
Kilogramme	=	15433·0000	=	2·204
Myriogramme	=	154330·0000	=	22·047

II.—Measures of Capacity.

The cubic inch contains 252·5 *imperial grains of water at* 62°.

		Cubic Inches.		Imperial.	
				Gallons.	Pints.
Millilitre	=	0·06112			
Centilitre	=	0·61120			
Decilitre	=	6·11208			
Litre	=	61·12079	=	0	1·76577
Decalitre	=	611·20792	=	2	1·4464
Hecatolitre	=	6112·07920	=	22	0·2640
Kilolitre	=	61120·79208	=	220·47	
Myriolitre	=	611207·92080	=	2204·71	

II. CHEMICAL MANUFACTURES.

ON A NEW METHOD OF PHOTOGENIC DRAWING.*

BY DR. SCHAFHAEUTL.

After some observations on the comparatively low value of all drawings taken by means of the camera-obscura, in an artistical point of view, and on the principal points on which Mr. Talbot's and M. Daguerre's methods of fixing the drawings of the camera-obscura were founded, Dr. Schäfhaeutl proceeded to describe his peculiar methods of producing photogenic drawings in Mr. Talbot's, that is, in a negative way; he then described two new methods of obtaining photographs in a *positive* way.

His first method tended to obtain a paper of very great sensibility by a comparatively short process. He recommended Penny's improved patent metallic paper, and spreading a concentrated solution of the nitrate of silver (140 grains to 2½ drachms of fused nitrate to 6 fluid drachms of distilled water), by merely drawing the paper over the surface of the solution contained in a large dish. To convert this nitrate of silver into a chloride, he exposed it to the vapors of boiling hydro-chloric acid. A coating of chloride of silver, shining with a peculiar silky lustre, was by this method generated on the surface of the paper, without penetrating into its mass; and in order to give to this coating of chloride of silver the highest degree of sensibility, it was dried, and then drawn over the surface of the solution of the nitrate of silver again. After having been dried, the paper was ready for use; and no repetition of this treatment was able to improve its sensitiveness.

The author's process for definitively fixing the drawing was as follows :—

He steeped the drawing from five to ten minutes in alcohol, and, after removing all superfluous moisture by means of blotting-paper, and drying it gently before the fire, the paper thus prepared is finally drawn through diluted muriatic acid, mixed with a few drops of an acid nitrate of mercury.

The addition of the nitrate of mercury requires great caution, and its proper action must be first tried on paper slips, upon which have been produced different tints and shadows by exposure to light; because, if added in too great a quantity, the lightest shades entirely disappear. The paper, after having been drawn through the above-mentioned solution, is well washed in water, and then dried at about 158° Fahr., or, in fact, till the white places of the paper as-

* *British Association.*

sume a very slight tinge of yellow. The appearance of this tint indicates that the drawing is fixed permanently.

Dr. Schäfhaeutl's mode of reversing the drawing is, in the principal points, the same as that suggested by Mr. Talbot. In order to obtain a photogenic drawing in a direct or positive way, he uses his above-mentioned paper, allows it to darken in a bright sunlight, and macerates it for at least half an hour in a liquid, which is prepared by mixing *one part* of the already described acid solution of nitrate of mercury, with from nine to ten parts of alcohol. A bright lemon-yellow precipitate, of basic hyponitrate of the protoxide of mercury falls, and the clear liquor is preserved for use. The macerated paper is removed from the alcoholic solution, and quickly drawn over the surface of dilute hydrochloric acid (1 part strong acid to 7 or 10 of water), then quickly washed in water, and slightly and carefully dried in a heat not exceeding 212° of Fahr.

The paper is in this state ready for being bleached by the rays of the sun; and in order to fix the drawing obtained, nothing more is required than to steep the paper a few minutes in alcohol, which dissolves the free bi-chloride of mercury. The maceration must not be continued too long, as in that case the paper begins to darken again.

The second method of producing positive photogenic drawings was by using metallic plates, and covering them with a layer of hydruret of carbon, prepared by dissolving pitch in alcohol, and collecting the residuum on a filter. This, when well washed, is spread as equally as possible over a heated even metallic plate of copper. The plate is then carbonized in a close box of cast iron, and, after cooling, passed betwixt two polished steel rollers, resembling a common copper-plate printing-press. The plate, after this process, is dipped into the above-mentioned solution of the nitrate of silver, and instantly exposed to the action of the camera. The silver is, by the action of the rays of the sun, reduced into a perfect metallic state, and the lights expressed by the different density of the milk-white deadened silver, the shadows by the black carbonized plate. In a few seconds, the picture is finished; and the plate is so sensitive, that the reduction of the silver begins even by the light of a candle.

For fixing the image, nothing else is required, except dipping the plate in alcohol mixed with a small quantity of the hyposulphite of soda, or of pure ammonia.

PROCESS OF BLEACHING COTTON.*

There is at present a mode of bleaching cotton, which is done purely by steam. It consists in steeping the cloths in an alkaline ley. They are placed, when thus steeped, in a tub with a double bottom; the first bottom on which the cotton goods rest is pierced with holes. Below this tub is placed a boiler, in which water is heated to the boiling point. The steam having no other escape, is obliged to pass through the cotton goods. At first it is condensed. After a little time the cloths become hot, and the steam does not pass through them until it has heated the whole quantity to the boiling heat. It will be perceived, that by this means the dirty water never comes in contact with the cotton fabric, as the water distilled by boiling alone touches them.

This method, which is attended with many inconveniences, has not yet, that we know of, been adopted, excepting for the washing of domestic linen, and it has not even in that respect been much used. In some bleaching yards, the heating of the goods to be cleansed is effected directly by boiling in the ley. For this purpose, the boiler is in the form of a long vertical cylinder, of the same height as the tubs which it is to supply, and near to which it is placed. It communicates with each one by two horizontal tubes, fitted with stop-cocks; one of which tubes is fixed at the bottom, and the other some centimetres below the upper part of the boiler. When the tube is filled with cottons, the alkaline liquor is poured on them until they are covered by the ley. It is evident from this arrangement, that the boiler will be filled to the same level as the tubs. When the fire is lighted under the boiler, the heated portions of the liquid near the bottom rise to the top by their diminished specific gravity, and the liquid rises higher in the boiler than it is in the tub; but it then begins to flow immediately into the tub by the upper tube, and its place is supplied by the colder ley, which passes from the tub to the boiler, by the lower tube. It is in this manner that a circulation of the liquid is kept up until all the liquid mass has arrived at boiling heat. This method has the great advantage of not being attended with any danger, but it requires a much greater quantity of the alkaline liquor than the other. This is the cause of its use not having been more frequent.

When the chlorine is employed, the cloths should be dipped in a very weak solution of the chloride of lime. They should

* *Moniteur Industriel*, and *Inventor's Advocate.*

not remain any length of time in the chloride bath; but should be steeped only for a few minutes, and then taken out, otherwise it might happen that some pieces of the chloride of lime might be deposited on the cloth, and make holes.

The action of the acids, which are employed immediately after the chloride of lime, is intended to decompose the chlorine on the cloth; by which means the chlorine in a state of gas attacks the coloring matter with all its energy. This produces sulphate of lime, which is removed by the subsequent rinsings. These processes require the greatest care, otherwise if any of the acid liquor remained on the cloth, it would destroy its fabric.

The foregoing is the mode of bleaching which was generally pursued, until the new process was introduced by Messrs. Price and Dunn, chemists and bleachers, near Boston, in the United States. Those gentlemen communicated, in 1837, to the Society of Manufactures at Mülhausen, that they had succeeded, and without a single failure, in removing grease marks by a ley of chalk; but, instead of using caustic soda in the subsequent operations, they used only carbonate of soda, or carbonate of potash. The Society at Mülhausen proceeded to test the experiment, and it was found that the process indicated by Messrs. Price and Dunn fully answered.

This is what takes place in the course of the operation:—The ley of lime converts the greasy matter into a chalk soap; and in the subsequent washing, the carbonate of soda or potash, by means of double decomposition, makes a soap of soluble potash or soda, and of the insoluble carbonate of lime, which has no affinity for the cotton.

M. A. Scheurer, who was employed by the Society at Mülhausen to examine and make a report on this method of bleaching, thus describes the different processes:—

A piece of cloth was sent to me to bleach, which had been woven a long time, and was covered with grease marks produced in the weaving; there had also been purposely made on it some stains of a drying oil, well dried in with heat; and new stains of tallow were fixed on it, by passing a heated iron over it to burn it well into the cloth. I first soaked it for four hours in a hot thick ley. Next, in lukewarm acid for half an hour. Then in a lukewarm ley of soda, for four hours. Fifth, in an acid solution. The cloth treated in this manner had all the marks of grease removed, but it was not sufficiently white. I then steeped it in a weak mixture of chloride of lime and acid; in a ley of carbonate of soda for four hours; and again in a mixture of chloride of lime and acid. The cloth was by these means rendered beautifully white. It is desirable to steep the cloth in an acid after having been in the lime ley, as the acid removes the excess of lime from the calcareous soap which is formed. It must not be either too strong or too hot; as nearly cold as possible is the best, and the cloth should be soaked for more than four hours. For this purpose, muriatic acid is preferable to sulphuric.

Most of the bleachers in Alsace, and many other countries, have adopted this process. In a report to the Mülhausen Society, dated the 18th December, 1839, M. E. Schwartz insists on the necessity of steeping the cloth in an acid ley, immediately after the ley of lime; because, he says, that at present the decomposition of the calcareous soap on the cloth by carbonate of soda is not required, but rather the complete decomposition of this calcareous soap by an acid, thus to detach the greasy matter, which in this state is more easily soluble by the carbonates of the alkalis, than by alkalis in their caustic state.

METHOD OF EXAMINING STEEL, BAR IRON AND CAST IRON.*

BY M. BERZELIUS.

The iron is reduced to filings as fine as possible, because the operation is much quicker when the metal is very finely divided.

The iron is afterwards digested in a solution of chloride of copper, in sufficient quantity to convert it into chloride of iron. This takes place in twenty-four hours, at a temperature of 50° C., if the iron is not in too large pieces. It is easy to ascertain, by means of a glass rod, if any undissolved pieces remain. The liquor is separated and filtered in the apparatus described farther on. Fresh concentrated chloride of copper, to which hydrochloric acid has been added, is poured on the residue, which is formed of copper mixed with carbon; the whole is digested until the copper is dissolved in the state of chloride. The carbon remaining must not be separated with paper. The separation is made with the following apparatus:—

In the bottom of a tube terminating in a point, is put a compressed mass of asbestos, previously boiled in hydro-chloric acid, and afterwards heated to redness. Instead of asbestos, spongy platinum may be used, but is not so well to be depended on. The solution is to be filtered through this mass, and the remaining chloride is removed with hydro-chloric acid; it is then washed with water. If the operation do not require any

* *Poggendorff's Annalen*, vol. xlvi. page 42.

great accuracy, the residue may be dried in a current of air which has passed through a tube filled with chloride of calcium, while the mass is heated to about 130° C., in a suitable bath.

If the weight of the tube and of the asbestos be known by weighing the tube, that of the residue may be obtained. As much of it as can be disengaged from the asbestos is then weighed, and burned with charcoal; the residue is analysed.

But this method, in order to determine the carbon, is never quite accurate, because, in the first place, this mass, when heated in the tube, always gives, whether in the air or in oxygen, products resulting from the distillation of organic substances, which show that when the carbon is separated from the iron with which it is chemically combined, a combination of carbon and hydrogen, perhaps also of oxygen, is formed; and, in the second place, because the carbon condenses in its pores air and water, with such energy, that it becomes heated on being put in contact with the air, after being dried *in vacuo*.

On these accounts, it is better to remove the charcoal with asbestos, to mix the whole, first with chlorate of potassa, then with thirty, forty, or fifty times its weight of oxide of copper, and to determine the proportion of charcoal, as would be done in an organic analysis.

In the same tube in which the residue of the steel or bar iron has been filtered, it is burned in a slow current of oxygen collected over mercury; the carbonic acid is extracted by means of hydrate of potassa. By this method, it has been found that iron, prepared by the "*puddelage*" process, contains only $\frac{1}{10}$ of the quantity of carbon contained in the bar iron prepared according to the ordinary method.

In order to ascertain the other foreign matters contained in iron, the following method is made use of:—

A bottle for disengaging gas is taken, the neck of which is hermetically closed by a conical glass tube, in its turn closed by a glass stopper; a second tubulure, at the side and near the top of the bottle, receives a disengagement tube. In this bottle iron is dissolved in dilute hydro-chloric acid: ten grammes of the metal must be operated on, and often more: the gas is driven into a tube containing a rather weak solution of caustic ammonia, mixed with nitrate of silver. In order to prevent small portions of the liquid from following the gas, a small quantity of cotton is stuffed into the middle of the disengagement tube. During the disengagement of the gas, which should be carried on slowly, the ammoniacal solution of silver absorbs the sulphur, arsenic and phosphorus. The solution is then slowly continued for several days. In this operation there is always obtained a small precipitate of silver which, when the iron is perfectly pure, it would seem, can be only carburet of silver. The dry way with saltpetre is the best method of treating the precipitate obtained in the solution of silver: the sulphuric, arsenic, and phosphoric acids are afterwards separated by the ordinary methods.

The solution contained in the bottle is separated by filtration from the undissolved portion, and the latter is examined to see if it contain arsenic, ranadium, and magnesia, either by treating it with nitro-muriatic acid, or by carefully oxidising it in the dry way, by means of saltpetre and carbonate of soda, after which the silica must be separated.

The solution is afterwards oxidized by means of nitric acid; or a better way is to saturate it with chlorine, and precipitate the oxide of iron by a slight excess of pure carbonate of lead. The solution is filtered, the precipitate is washed, and the liquid is evaporated to siccity in a sand-bath and treated with alcohol at 0·84, which leaves chloride of lead; it is then examined whether the alcoholic solution contains lime, potassa, manganese, or any other substance. The chloride of lead may be decomposed by means of sulphuretted hydrogen, and the liquid may be examined.

The precipitate obtained by means of carbonate of lead is to be treated in the dry way, by carbonate of potassa and soda; it is afterwards examined as to whether the alkali procured from it contains alumina, phosphoric acid, arsenic, or any other substances.

In this way, it will be difficult for any substance to escape notice.

NEW PROCESS OF ZINCING COPPER AND IRON.*

The German chemist Boettiger, in making some attempts to give to sheets of copper, by means of solvents, the appearance of pinchbeck or brass, as is done in the manufacture of mosaic gold by means of the vapors of zinc, has discovered a simple and economical means of covering with a brilliant coating of that metal all kinds of articles of copper manufacture, which may be useful for various purposes. It may be supposed from the effect produced in the voltaic pile on the discs of copper and zinc by pasteboard soaked in a solution of sal ammoniac, that that salt is the best agent to cover any metallic substance with a coating of zinc.

To perform the operation, granulated zinc (obtained by pouring the melted metal into a hot iron mortar, and stirring it rapidly with the pestle till it becomes solid) is placed

* *Inventors' Advocate.*

in a porcelain capsule, or any other non-metallic vessel ; a saturated solution of sal ammoniac is poured upon it, and heated to the boiling point. The articles to be covered with zinc are then put in, after having been previously well cleaned with a weak mixture of hydro-chloric acid, and in a few minutes they are covered with a brilliant coating of zinc, which adheres with great tenacity, and cannot be removed by common friction. Iron and steel may be plated with zinc in the same manner, after having first coated them with copper by placing the articles in a solution of sulphate of copper.

CASTING BY GALVANISM.*

In a leaden vessel, furnished with an external case to hold the chemical agents, is placed a bag formed of raw hide or parchment, enclosing a cylinder of zinc immersed in sulphuric acid diluted with water. This forms the voltaic battery. In a trough placed near the battery, is put the solution of sulphate of copper dissolved in sulphuric acid, and the model, either hollow or in relief, of which it is intended to produce a fac-simile in copper. The communication is made by means of a strip of lead, and the model being previously covered over with a metallic preparation or film, is thus brought into connection with the leaden vessel, and with sheets of copper which surround and cover over the model, and which communicate also with the cylinder of zinc. The operation then begins, and ought to be conducted with slowness and regularity; observing to keep the liquids always at the same degree of strength and action, which can be measured by the galvanometer. If the operation be too rapid, the surface of the cast is rough and streaked; the metallic atoms are unequally deposited, disturb the accuracy of the forms, and produce the effect of grains of sand. After the operation, the crust of copper which covers, or is inside the model, is brittle. To render it malleable, it is only necessary to expose it to a certain degree of heat. This heat at the same time destroys the models if they be in relief, and there remains only the external crust of copper; the suppleness of which may be increased to any extent by heat.

When the model is not metallic, it is requisite to submit it to a preparation that will make it capable of attracting the molecules of the copper contained in the solution of sulphate of copper. If it be a plaster model, it is covered with an impalpable copper powder by means of a fine brush. If it be a vegetable, it is steeped in a resinous oil, and it is then covered with the copper powder. Without this precaution, the operation would not succeed; and all the places where the copper dust does not adhere, will not receive the metal deposited by the galvanic action. There will, consequently, be holes in those places.

These directions comprise the principal parts of the process adopted by M. Soyer. When any part is omitted, or not carefully attended to, the streaks, inequalities, and alterations of form are produced, which were frequent in the first attempts to pursue this process. At present, all these defects and difficulties have been removed, and the whole face of the bust of young Hercules, presented, on the 17th of August, to the Academy of Sciences at Paris, is completely devoid of the least imperfection. In the hair alone is there any trace of the sand-like appearance, which arises from the rapidity with which it was necessary to complete the operation in order to have the bust finished before the meeting of the society.

The opening which the galvanoplastic process affords to future applications of the principle in the arts, seems to be immense. Even as at present known, the process presents so much certainty, and such advantages in point of economy, that M. Soyer has not hesitated to make an offer to the municipal council of Paris, to execute for 200,000 francs, a cast of the colossal elephant of the Bastile, which, in the ordinary mode of casting, would not cost less than 600,000 francs. The process will prove still more economical when applied to produce ordinary statues and public monuments, which need not be more than one-third their present thickness of metal.

The makers of artificial flowers, the manufacturers of copper instruments, goldsmiths and jewellers, may also derive great advantages from the galvanoplastic process, for it is not confined to copper alone, but may be extended to silver, gold, or platinum. By this means, any object in nature may be made into a model on which a casting in metal can be made as perfect in form as the natural prototype. There seem scarcely any limits, indeed, to which this process may not be extended in reproducing, in a solid metallic form, castings of every kind, and from any pattern, whether of natural or artificial objects.

TO DEPOSIT SOLID VOLTAIC PLATES, HAVING THE LINES IN RELIEF.*

Take a plate of copper, lead, silver, type-metal, or any metallic substance, of the

* *Inventor's Advocate.*

* *Spencer's Instructions for the Multiplication of Works of Art in Metal.*

required size, and engrave on it to the depth requisite to print from when in relief; then solder it to a piece of copper wire. Contrary to ordinary engraving, the lines must be flat at the bottom, and as nearly as possible of the same depth. When so engraved, heat the copper plate, and apply wax to the plate, in the manner already mentioned, to prevent the voltaic copper from adhering.

The plate must now receive a couple of coats of varnish on the backs and edges, the varnish consisting of a preparation of shellac and alcohol, or of melted bees' wax. Care must be taken to keep the engraved surface of the plate clean.

It is now ready to be placed in the apparatus, to be deposited on.

Should the plate be lead, or, what is still better, type-metal, the wax does not require to be applied, in the first instance, to the front of the plate, as, when it is deposited on to the given thickness, the application of heat is alone sufficient to loosen the plates.

I do not anticipate that this method of procedure will ever prove very generally useful, although, in some instances, I can believe it may be advantageous to adopt it. Where strong outlines are required to print along with matter set up in type, it may be economical, as in geometrical figures, or those of crystals, &c.

Lines in wood engravings are *left standing*, all the surrounding matter to be *cut away*, necessarily entailing much labour; but by this method, all the lines that are required ultimately to be in relief, would have to be sunk in the plate of soft metal, a process that would require little more time to perform than drawing them.

The tools to cut the metal should be formed with flat faces, and with a guage to indicate when they had arrived at the proper depth.

The engraving necessary for a whole work on geometry, for instance, or where diagrams are requisite, might be so cut in one single sheet or plate of type-metal, the letters or figures of reference being punched in, and the whole deposited on *at once*.

When deposited to a sufficient thickness, the voltaic plate, having the lines and letters in relief, might then be separated into the requisite number of pieces, and each mounted with roman cement moistened with drying oil, on small blocks of wood, to bring them up to the level of type.

Should any of the lines rise above the others, they may be smoothed down by rubbing the face of the block on a *smooth* flag with a little water, and the lines, if necessary, could now be retouched with the graver. To a small extent I have seen this plan adopted with perfect success.

Another Method.

I have occasionally tried another method, which, in the hands of a practical engraver, might be useful. Take a copper or brass plate, and give it a coating of fine plaster of Paris or other substance. When dry, let the surface of the plaster be rubbed down level, until there is as much thickness left as the lines are required to be in relief to print from. It must now be smoked with the flame of a lamp, and the lines drawn in the surface thus prepared. The brass or copper plate will prevent the point used from going deeper than is necessary, consequently, the lines will be all of the same depth. When the engraving is completed, let the plaster surface be metallized with the nitrate of silver and the phosphoric solution, as already described. This done, a plate of solid copper may be deposited on its surface, all the lines being perfectly level.

TO RAISE LINES IN RELIEF ON A PLATE OF COPPER OR OTHER METAL.*

Take a plate of copper, or any other metal. It is not essential that it should be highly polished.

Have a piece of copper wire neatly soldered to the back part of it, then give it a coating with a camel hair brush of either of the cements just mentioned. This is best done by heating the plate as well as the wax; or, to level the wax after it has had a coat, hold the back part of the plate over a charcoal fire or a spirit lamp,—taking care to have it level.

Then write or draw the design on the wax or cement with a point. The wax must now be cut through with a graver or steel point, taking special care that the copper *is exposed in every line.*

It must now be immersed in dilute nitric acid, say three parts of water to one of acid. It will at once be seen whether it is strong enough, by the green color of the solution, and the bubbles of nitrous gas eliminated. Let it remain long enough to allow the exposed lines on the plate to be *slightly* corroded, that the wax, which gets into the pores of the copper during the heating process, may be thoroughly got rid of. Practice will determine this better than any rules.

The plate is now ready to be placed in the voltaic apparatus. After the voltaic copper has been deposited on the lines engraved in the wax, the surface of the formation will be found to be more or less rough, according to the quickness of the action. To remedy

* *Spencer's Instructions for the Multiplication of Works of Art in Metal.*

this, rub the surface with a piece of smooth flag or pumice stone, with water. Then heat the plate, and wash off the wax ground-work with spirits of turpentine and a brush.

A card plate, having the lines in relief on this plan, was procured by me more than two years ago; a few copies were printed from it, but they were coarse.

CHEMICAL BRONZE.

To the Editors.

GENTLEMEN,—I take the liberty of replying to a request of one of your correspondents to be informed of the method of bronzing metals:* it is as follows:—

Mix 62 grains of muriate of ammonia, 15·5 grains of oxalic acid in a pint of good vinegar,—after having well cleaned the metal to be bronzed, rub it over with a brush dipped in this solution, taking only a very small quantity at a time; when it is dried by rubbing, take some more, and continue so doing till the metal has acquired the tint required.

To render the proceeding more expeditious, it may be performed in the sun or on a heated stove. This will give different objects the appearance which distinguishes the ancient bronzes.

I am, Gentlemen,
Your Obedient Servant.
J. R. S.

* *The Chemist*, No. VII. page 224.

III. PHARMACY, &c.

MR. HAWES' MEDICAL REFORM BILL.

We have much pleasure in being enabled to lay before our readers an abstract of this bill; it is entitled:—

A BILL TO AMEND THE LAWS RELATING TO THE MEDICAL PROFESSION IN GREAT BRITAIN AND IRELAND.

I. *Preamble.*—WHEREAS it would tend to the advantage of the public to alter and amend the laws touching the medical profession, and to make due provision for the prevention of persons not being duly qualified from practising the art of medicine, and to provide that persons, before practising the same, shall be duly examined as to their skill and knowledge, by learned and competent persons, and thereupon be permitted to follow and exercise the Art of Medicine in any part of the British dominions.

II. *Interpretation Clause.*—Be it therefore enacted, That in this act, the words "Art of Medicine" be construed to include within their meaning the recommending, prescribing or ordering, either directly or indirectly, any medicine, remedy or application whatsoever, for the relief or cure of any disorder, ailment or illness of the body or mind, or any part thereof, or performing any surgical operation, minor or capital, or practising midwifery; and the words "Medical Practitioner" shall mean a person qualified under this act to practise the Art of Medicine; and that the words "Chemist and Druggist" shall mean a person who shall sell, deal in, mix, or dispense for sale, any drug or medicine for the cure or relief of any bodily disorder, ailment or illness, excepting such persons as shall have obtained a certificate to practise the Art of Medicine; and the word "England" shall include Wales.

III. *Registrars of Medical Practitioners.*—And be it enacted, That within three months from the passing of this Act, the Secretary of State shall appoint three persons to be registrars,—one for England, another for Scotland, and another for Ireland; each of these registrars to have his office in the metropolis of the country for which he is appointed to act: and the Secretary of State shall also appoint such clerks and other officers as he shall deem necessary for assisting in carrying this act into execution, until the election of the first councils, as hereinafter provided: Secretary of State to have the power of removing any person so appointed. Before the election of such councils, all reasonable and necessary expences of carrying this Act into execution, to be paid by the Lords of the Treasury out of any monies received by the said registrars by virtue of this act.

IV. *Persons at present legally qualified to practise Medicine or Surgery.*—And be it enacted, That the said registrars shall, within thirty days of their appointment, distribute certificates to practise the Art of Medicine, according to the form ordered by this Act, to every person applying for the same, and producing his diploma, certificate or license to practise Medicine or Surgery, dated prior to the passing of this Act, granted by any English, Scotch, or Irish University, Col-

lege, Hall, or other person or corporation, legally entitled to grant the same at the time of the passing of this Act, and also to every person who shall apply for the same, and who was actually practising Medicine in England prior to August 1st, 1815; registrars to grant certificates to practise Medicine, or licenses to carry on the trade and business of a Chemist and Druggist, only for that part of the United Kingdom for which they shall severally be appointed to act.*

V. *Payment for Certificate.*—And be it enacted, That every person applying for a certificate to practise Medicine, shall pay for it to the registrar, the sum of [ ], and shall be subject to the like payment annually. The certificate shall bear date from the day on which it is granted, and shall continue in force until Feb. 1, 1843; and the registrars shall, at any time within one month before Feb. 1, in each year, grant such certificates to any persons entitled to them, taking effect from their date, and remaining in force until February 1, in the year following; and each registrar shall enter in a book every certificate he grants, and shall print a correct alphabetical list of all persons to whom he has granted such certificates for the ensuing year; and those persons only whose names are contained in the last printed medical lists shall be entitled to vote at any election held for the purposes of this Act: these lists shall be furnished by the respective registrar to every person who shall apply for the same, on payment of 6*d.* for each copy.

VI. *Council.*—And be it enacted, That on the first day of June, 1842, the medical practitioners residing in England, and registered under this Act, shall elect a council for England; those in Scotland, for Scotland; and those in Ireland, for Ireland: each council to consist of twenty, who shall go out every three years; each councillor shall be eligible to be re-elected.

VII. *Candidates for Council to be Nominated.*—And be it enacted, That forty days previous to the day of each election, any voter, duly qualified as above, may give or transmit to the registrar a paper according to the form prescribed by this Act, signed by not less than six voters, containing the names of persons whom he considers fit to be elected as councillors, and the registrar shall print a list of all such persons (unless they be members then going out of office), together with names of the persons recommending them, in the voting papers to be used at the next election, persons so nominated alone shall be eligible to be elected.

VIII. *Place of Election.*—The elections are to be held at a place appointed by the respective councils; that for England, within four miles of the General Post Office, in London; those for Scotland and Ireland, within two miles of the Post-Offices in Edinburgh and Dublin respectively: notice of election to be given at least ten days before it takes place, by advertisement in the principal local paper: the first election of councillors shall be held at places appointed by the registrars.

IX. *Method of Voting at Elections for Council.*—Every election shall be held before the registrar, to commence at nine A. M., and finally close at four P.M. of the same day, and every voter may vote for the whole number of councillors to be chosen, by delivering in to the registrar or his deputy a paper, according to the form laid down in this Act, folded or sealed up, so that the contents cannot be seen, containing the names of the persons for whom he votes. This paper may be sent by post, and in that case must contain a declaration according to the form prescribed in this Act. The registrars shall transmit to every voter, a paper and a declaration as aforesaid, which shall be returned to the registrar filled up, to be opened on the day of election, according to the provisions hereinafter made.

X. *Result of Election, how to be declared.*—After the election the registrar shall examine the voting papers to ascertain who are elected, and the twenty persons who shall have the greatest number of votes shall be the councillors elected. In case of an equality in the number of votes for two or more persons, the registrar shall publicly draw by lot from among those having an equal number of votes, as many names as shall be necessary to complete the number of councillors to be elected; and the names of the council shall be published in the local newspapers having the largest circulation within seven days after such election; and each of the past councils shall, after the year 1842, appoint two or more councillors, to see that the said election has been fairly conducted, and to certify the same. At the elections for councils in 1842, the Secretary of State shall appoint two persons to superintend the election.

XI. *Medical Colleges and Corporations at present in Existence.*—The University of Oxford, in convocation assembled, and the Senates of the Universities of Cambridge and London, and the *Fellows* of the London College of Physicians, and the *Council* of the London College of Surgeons, and the Court of Assistants of the Apothecaries'

* Want of space compels us to omit this form, together with many others prescribed under this Act.—Eds. Chemist.

Society in London, shall, if they think fit, severally appoint one fit person to be a member of the council for England; and the Faculties of Medicine in the Universities of Edinburgh, Glasgow, St. Andrew's, and Aberdeen, and the Councils of the Edinburgh Colleges of Physicians and Surgeons, and of the Glasgow Faculty of Physicians and Surgeons, shall, if they think fit, severally appoint one fit person to be a member of the council for Scotland; and the Provost and Fellows of Trinity College, Dublin, and the Councils of the King's and Queen's College of Physicians in Ireland, and the Dublin College of Surgeons, and the Dublin Court of Apothecaries' Hall, shall, if they think fit, severally appoint one fit person to be a member of the council for Ireland.

XII. *Future Registrars.*—On the occurrence of a vacancy in the office of registrar the several councils shall appoint another registrar; or, in case of their failing to do so, the Secretary of State shall appoint one.

XIII. *Council may remove Registrar.*—The council of each kingdom may remove a registrar for neglect, misconduct, or infirmity of body or mind; and in the event of the office being at any time vacant, such vacancy shall be advertised in the newspapers of the largest circulation within the kingdom for which he acted, six weeks previous to the day for electing a successor. Candidates to give notice of their intention to the council fourteen days previous to the election. If any registrar is absent or incapable for a time, the president of the council shall appoint a good deputy to act for him.

XIV. *Officers appointed under this Act.*—On the 14th of June in every year each council shall elect, by ballot, a president for one year; and if he die, or cease to hold the office, the council shall, within ten days, elect by ballot another for the remainder of the year; and shall also appoint a treasurer, not being a member of the council; and three auditors of the accounts of the council; and also their own clerks and other officers. The councils may remove any treasurer, auditor, clerk, officer, or servant so appointed, and appoint other persons to fill those offices when vacant; and shall fix the salaries of the registrar, treasurer, and others employed by them; and also such remuneration to the individual members of council for the execution of their duties as they shall deem reasonable.

XV. *Meetings and Voting of Councils.*—All acts of the council may be decided by the majority present; and the meeting must consist of a majority of the whole council. The president, if present, to have a casting vote. The meeting of council to be notified three days beforehand, by summons sent to the abode of each member.

XVI. In this clause provision is made for the holding of special meetings.

XVII. *Monies of Council.*—All monies, fees, and dues belonging to the council, shall be paid to the treasurer, to be by him carried to the account of a fund to be called "The Medical Fund," and to be applied towards the payment of all expenses incurred in carrying this Act into effect; and in case "The Medical Fund" shall be more than sufficient for these purposes, the surplus may be applied from time to time towards the encouragement and advancement of medicine, and of science and literature connected therewith, as the senate hereinafter mentioned, and council conjointly, shall think most desirable.

XVIII. *Payments.*—The treasurer shall pay no money out of the fund, except upon the order of three or more members of the council, countersigned by the registrar, except as hereinafter provided.

XIX. *Accounts.*—The treasurers' and registrars' accounts shall, in June and December in every year, be regularly audited and published, along with the current medical list.

XX. *The Councils when at Law.*—And be it enacted, That the councils may sue and be sued in the name of their registrar for the time being, who is to be deemed plaintiff or defendant in every such suit or action; but the registrar, although appearing as plaintiff or defendant on the record, may, if not otherwise interested or objectionable, be a witness in every such action.

XXI. *Election of Medical Senate.*—And be it enacted, That within thirty days next after their election in 1842, and in the December of every fifth succeeding year, each council shall elect from amongst themselves, or others, by ballot, three fit and proper persons, who shall be called "the Medical Senate of Great Britain and Ireland," and shall continue in office five years. Vacancies in the senate to be filled up by the councils for the remainder of the five years. Members of senate shall be capable of being re-elected.

XXII. *Registrar of the Senate.*—The registrar for England shall be the registrar to the senate.

XXIII. *Meetings of the Senate.*—The senate shall, on the 10th day of July in every year, meet in London, at the usual meeting place of the council for England; and all reasonable expenses of the members of the senate attending any such meeting shall be defrayed out of "The Medical Fund" of the respective councils. The rest of the clause makes provision for the hold-

ing of special meetings of the senate, at the desire of any two of the councils.

XXIV. A majority of the whole senate must be present, and assent to acts of the senate.

XXV. *President of Senate.*—At its annual meeting, the senate shall elect by ballot its own president for one year. A vacancy to be supplied in the same way for any portion of the twelve months.

XXVI. *Privileges of Senators.*—It shall be lawful for any member of the senate to be present at any meeting of the councils, and take part in its discussions, but not vote at these; and also to be present at any examinations held by any examiners appointed under this Act.

XXVII. *Expenses of Senate.*—All expenses of the senate (excepting the expenses of its members attending the same as herein-before provided) shall be divided into three equal portions; and the senate shall make an order, signed by three members, and countersigned by their registrar, for the payment of the one such portion upon each of the treasurers of the several councils, who shall pay the sums expressed in such orders out of any monies coming into their hands under this act.

XXVIII. *Bye-laws regulating Medical Education and Examinations for Diplomas.*—The Senate shall make such bye-laws for the United Kingdom, regulating in all respects the education of candidates applying to be examined for a diploma of qualification to practise medicine, or to carry on the trade and business of a chemist and druggist, and also regulating the examinations of persons prior to the granting of the said diploma, as from time to time shall seem proper to the said Senate; and such persons only as shall comply with such bye-laws shall be admitted to such examinations. And be it further enacted, that no such bye-law shall be of force until forty days after a copy thereof has been published in the *London Gazette*, and another copy thereof has been sent to the Secretary of State for the time being; and if at any time her Majesty, by and with the advice of her Privy Council, shall disallow such bye-laws, or any part thereof, such bye-laws, or the part thereof so disallowed, shall be null and void. If the Senate neglect to publish any such bye-laws within twelve months, the Secretary of State shall make and publish them: provided also, that any such bye-laws shall not be valid unless they require that previous to the final examination of any person desirous of obtaining a diploma of qualification to practise the art of medicine, he shall produce a diploma, certificate, or letters testimonial, of having taken a degree in medicine, or of having passed an examination in medicine or surgery before some university, college, hall, or other persons, legally entitled to grant a diploma, certificate, or letters testimonial, at the time of the passing of the Act.

XXIX. *Senate to publish a New Pharmacopœia.*—And be it enacted, That the Senate shall cause their registrar to publish, under their direction and authority, a book containing a list of medicines and compounds, and the manner of preparing them, together with the true weights and measures by which they are to be prepared and mixed, &c., to be called *The British Pharmacopœia;* and that the senate may alter and amend such Pharmacopœia as often as they deem necessary; and every chemist and druggist shall mix, make, and compound, according to the directions therein contained, and according to no other formulary, and obey in all respects the orders therein directed.

XXX. *No Person to practise Medicine, or carry on the Trade of Chemist and Druggist, unless qualified under this Act.*—And be it enacted, That no person whatsoever shall, from the 1st of Feb. 1842, practise medicine for remuneration or gain, directly or indirectly, in any part of the United Kingdom, unless he has obtained a certificate to practise the said art according to the provisions of this Act; nor shall any person from the 1st of December, 1842, carry on the business of a chemist and druggist in any part of the United Kingdom unless he has obtained a licence under this Act.

XXXI. *Present Licensing Bodies.*—After the publication of the bye-laws for regulating the examinations for diplomas to practise medicine, no corporations nor any university, except under this Act, shall grant a diploma, certificate, or licence to practise medicine, or to carry on the trade of a chemist and druggist in any part of Great Britain and Ireland.

XXXII. *Council to appoint Examiners annually.*—And be it enacted, That each of the councils shall appoint annually fit persons to be examiners for granting diplomas in medicine, or licences to carry on the business of a chemist and druggist; and such examiners shall examine as the senate shall direct, all candidates who may prove to be duly qualified according to the bye-laws of the senate, and report the result of the said examinations to their respective councils, who shall direct their registrar to grant a diploma to practise medicine, or carry on the trade of chemist and druggist according to the forms annexed, to every person whom the council shall deem qualified, upon the payment of the sum of [ ] for such diploma; and every person who shall have obtained such diploma may obtain from one of the registrars a cer-

tificate or licence to practise medicine, or trade as a chemist and druggist, and to renew it annually; and no person, except as herein provided, shall receive such a certificate or licence unless he pass such examinations aforesaid.

XXXIII. *Navy and Army Surgeons.*—Every person desirous of being appointed medical officer in Her Majesty's army or navy shall be eligible for such appointment upon obtaining a diploma of qualification, or a certificate to practise the art of medicine, and, while actually employed in Her Majesty's service, shall not be compelled to renew it annually.

XXXIV. Dentists or cuppers now in practice shall, before the 31st of December, 1842, send a declaration as prescribed under this Act, signed by themselves and two substantial householders, to the registrar, and shall obtain a certificate giving them leave to practise still what they practised before.

XXXV. *Licence to carry on the Trade of a Chemist and Druggist.*—And be it enacted, That each registrar shall grant a licence to carry on the business of chemist and druggist, according to the form annexed, to every person who has received a diploma of qualification from either of the counceils, upon the payment of the sum of [ ] for such licence, to be renewed annually, on the 30th day of November; and each registrar shall register every licence which he grants as aforesaid, and publish the same in his medical list; and also the registrar shall grant the same to persons already, before the passing of this Act, carrying on the trade of chemist and druggist, or persons being assistants or apprentices, and applying within twelve months to the registrar for the same, and these persons are not to renew it annually unless they desire: provided always, that if any person as aforesaid shall once renew his licence as aforesaid, it shall not be lawful for him to carry on the trade and business of chemist and druggist unless he continue to renew it annually.

Licence to carry on the Trade and Business of Chemist and Druggist.

I, A. B., by virtue of the powers vested in me by an Act of Parliament passed in the year of the reign of Her Majesty Queen Victoria, authorize C. D. of to carry on the trade and business of a chemist and druggist in that part of the United Kingdom of Great Britain and Ireland called until the 31st day of November, 18

Dated and signed by the medical registrar.

Licence to carry on the Trade and Business of a Chemist and Druggist.

I, A. B., by virtue of the power vested in me by an Act of Parliament, passed in the year of the reign of Her Majesty Queen Victoria, hereby authorize C. D., of to carry on the trade and business of a chemist and druggist, he having signed a declaration that he was engaged in the said business previous to the passing of the said Act.

Dated and signed by the medical registrar.

Declaration of Chemists and Druggists.

To the medical registrar for

I, A. B., of hereby declare that I was previous to the day of 18 at

Dated and signed

XXXVI. *Medical and Chemical Assistants and Apprentices.*—And be it enacted, That every medical practitioner, and every chemist and druggist, having any assistant or apprentice in his employ shall, before the 31st of December in every year, transmit to the registrar the name of such assistant or apprentice, according to the form annexed, together with a declaration in writing, signed by himself, according to the said form; and the registrar is required to register in a book the names of the persons so transmitted to him, and insert them in the medical list published next after the receipt of such declarations; and be it enacted, that no medical practitioner shall, after the 31st day of December, 1842, employ any person as an assistant who does not possess a diploma of qualification, or a certificate to practise the art of medicine; and no chemist and druggist shall employ any person to assist him in the actual vending of drugs and medicines who does not possess a diploma of qualification to carry on the trade and business of a chemist and druggist, or a licence according to the form above, unless such persons so being assistants to any medical practitioner or chemist and druggist shall be apprentices for any period not exceeding seven years, and duly registered: provided always, that any person being an assistant to any medical practitioner, or to any chemist and druggist, shall not be required to take out his annual certificate or licence during the time he shall be so actually employed.

Declaration of Assistants and Apprentices.

To the medical registrar for

I, A. B., of declare that I have in my employ [Insert christian and surname; age; whether assistant or apprentice; if apprentice, date of indentures; if assistant, date of diploma]; and I request that you will duly register the same.

(Signed)

N. B.—The person making such declaration must state whether he is a medical practitioner or a chemist and druggist. This

declaration must be sent to the registrar before the 31st of November annually.

XXXVII. *Powers and Privileges of Medical Practitioners.*—And whereas certain powers, benefits, privileges, appointments, acts and things, have, by custom, law, or right, been conferred on, or executed, or performed by physicians, or surgeons, or apothecaries, be it therefore enacted, That from and after the 1st of February, 1842, every power, privilege, appointment, and authority, heretofore held by any physician, or surgeon, or apothecary, by any law, charter, or custom, shall be held and enjoyed by persons possessing certificates to practise the art of medicine according to the provisions of this Act, and such persons only.

XXXVIII. *Money Accounts.* — And whereas disputes and differences have arisen as to the right of medical practitioners to recover at law charges for professional visits and consultations, be it therefore enacted, That any person duly qualified to practise the art of medicine may recover in any court of law by action of promises, or debt, any reasonable sum of money for professional visits and consultations, together with full costs of suit.

XXXIX. And be it enacted, That from and after the passing of this Act, every medical practitioner, and every chemist and druggist, shall be exempt from serving on all juries and inquests, and all parochial offices whatsoever, and in the militia, and as a constable, and their names shall not be returned in any list of persons liable to serve such offices as aforesaid.

XL. This clause imposes a penalty of £100 on any registrar or his deputy refusing or neglecting any duty enjoined by this Act.

XLI. This clause imposes a penalty of twelve months' imprisonment for illegally obtaining diplomas, certificates, or licences from any registrar.

XLII. This clause imposes a penalty of six months' imprisonment for making a false declaration under this Act.

XLIII. This clause imposes a penalty of £20 for each offence for illegally practising medicine, or carrying on the trade of chemist and druggist.

XLIV. And be it enacted, That every medical practitioner and every chemist and druggist who shall employ any assistant not being duly qualified according to the provisions of this Act, or who shall neglect to make a declaration of any person being an assistant or apprentice in his employ according to the provisions hereinbefore contained; and every person not being duly qualified according to the provisions hereinbefore contained, who shall act as an assistant to any medical practitioner or chemist and druggist, shall pay for every such offence any sum not exceeding ten pounds.

XLV. *Offences how to be tried.*—Offences under this Act may be prosecuted before any two of Her Majesty's justices of the peace in petty sessions assembled, acting in and for the county in which the offence has been committed, &c.

XLVI. And be it enacted, That in every adjudication of a penalty under this Act, and nonpayment thereof, it shall be lawful for the magistrate to commit the offender to any gaol within his jurisdiction, for one calendar month where the sum shall not exceed five pounds, and for three calendar months where the sum shall exceed five pounds, the imprisonment to cease on payment of the sum due, and the costs for the recovery thereof; and the one moiety of every penalty recovered shall be paid to the informer, and the remainder to the treasurer of the medical council for that part of the United Kingdom in which the offence was committed.

XLVII. Any person thinking himself aggrieved by such conviction may appeal to the justices of peace at the next general or quarter sessions of the peace, under such restrictions as are usual and proper in cases of appeal against convictions before magistrates.

XLVIII. Business happening to fall on a Sunday shall be done on the Monday following.

XLIX. And be it enacted, That this Act may be amended or repealed by any Act to be passed in the present session of Parliament.

The above is an abstract of Mr. Hawes's bill: our space will not admit of our commenting on it at present. We may, however, remark, that we think it the best of all the bills, as regards the Chemist and Druggist. Still, we are of opinion that it does not go far enough. We have long been of opinion that medical reform should be based on the entire division of the different branches of the profession: that the medical practitioner should be restrained from selling drugs and dispensing even his own prescriptions; and that the druggist should be prohibited from practising medicine and surgery. It may be urged that medical men are the fittest persons for making up their own prescriptions: this we deny; and our principal reason for doing so is, the notorious fact, that while it is their only source of remuneration, they will ever send to their patients a much greater quantity of medicine than is absolutely required. For this paltry mode of remuneration a scale of fees might be substituted; and we feel convinced that there is not one respectable medical practitioner who would not be delighted with such an improvement. It

would render the profession far more respected by the public than under the present system they ever can be—the members of a noble profession will no longer be identified with tradesmen. One of the chief advantages of a patient going to a physician, is the fact of the latter prescribing no more medicine than is required. Under the present system, if a medical man, on visiting a patient, finds that attention to diet is all that a patient requires, he will have taken this trouble for nothing, unless he sends in some medicine: under the plan we have proposed, he would give the necessary advice, and charge for his *visit*.

Druggists should have the SOLE DISPENSING of drugs; and should be compelled (as provided by this Act) to pass an EXAMINATION as to their fitness for their important avocation. In order to prevent them from adulterating drugs, as it has been urged they would do under such a disposition of affairs, a certain number of officers might be appointed to go round and inspect the drugs in their shops, and to take samples of those suspected, which samples should be sent, for the purpose of being analysed or tested, to a chemical officer of the proposed senate; or, if such an officer be not appointed, to any other experienced practical chemist who might be thought fit.

We recommend Mr. Hawes, whose bill, as far as it goes, gives us much satisfaction, to graft some clauses in it to the above purport: we are confident that such a measure will be hailed by all who have no sinister motives for opposing it—no personal desires to gratify by its rejection.

We strongly advocate the clause providing for the establishment of a "British Pharmacopœia."

A Letter to H. WARBURTON, Esq., M.P., *On the Utility of extending the Provisions of his bill to Chemists and Druggists; and on the Necessity of extinguishing Quackery by Act of Parliament.* By A DRUGGIST. London: E. Lumley, Chancery Lane.

This pamphlet is eminently worthy of the attentive perusal of chemists and druggists, as being a very able *exposé* of the flagrant abuses existing in that part of the medical profession to which they belong. It likewise contains some remarks on the necessity of making Mr. WARBURTON'S Bill applicable to the reform of these abuses. We are of opinion that Mr. W.'s bill would do but little towards this reform.

Want of space, occasioned by the necessity of inserting an abstract of Mr. HAWES'S Medical Reform Bill, precludes us from giving an extract from, or noticing at greater length this excellently written little pamphlet. Every druggist should purchase it; and it is no less interesting to the public generally, to whom we earnestly recommend its perusal.

EXEMPTION OF CHEMISTS FROM SERVING ON JURIES.*

Our readers will observe with pleasure, that Mr. Hawes has inserted in his bill a clause, providing for the exemption of Chemists from serving on juries, &c.*

LATE HOURS AND SUNDAY TRADING.

To the Editors of the Chemist.

GENTLEMEN,—The encouragement you gave me, by inserting my letter in No. IX. of your useful work, has induced me to address you on a subject of great importance: I mean "Late Hours," and "Sunday Trading."

The generality of Chemists in this part of London open shop at 7 o'clock, A.M., and close at 11 P.M., except on Saturday, when the hour for closing is 12 P.M. By no class of persons is this practice so severely felt, as the young apprentices. It frequently makes fearful inroads upon his constitution, and leaves him no time for "mental culture," or for increasing his scanty stock of chemical knowledge, by study, or experiment.

Who is able, amidst constant interruption, to devote that attention to the science of Chemistry, which it absolutely requires? After 11 o'clock most apprentices are glad to creep off to bed. Provided all would agree, there could be no possible objection to closing at least one hour earlier. As regards "Sunday Trading," this, I am sure, might be very much curtailed, for the dispensing of prescriptions and medicines absolutely necessary, forms but a very small portion of the business done on the Sabbath.

Let me beg of you, Gentlemen, in the name of the Chemists' apprentices of London, to exert your influence in bringing about a proper UNDERSTANDING among our masters; this is *all* that is required; they would enjoy any additional relaxation as much as ourselves. I remain, yours most respectfully,

AN APPRENTICE.

Chelsea, Nov. 12, 1840.

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* See *The Chemist*, No. VII. p. 212. and VIII. p. 247.

CAUTION AGAINST THE PERNICIOUS EFFECTS OF COPPER, PARTICULARLY ADDRESSED TO ELECTROTYPE EXPERIMENTALISTS.*

BY J. P. SIMON, M.D., OF DOVER.

Within the last two months, I have been engaged in a series of experiments in the new art of electrotype, and in that short space of time, I have dissolved not less than thirty pounds weight of sulphate of copper. In all my former experiments, I did not experience any apparent ill effect from the absorption of that salt into my system; but whether it was owing to the smallness of my surgery (or rather factotum laboratory) in which all my electrotype experiments are conducted, or to my being like the rest of my nation, French, of rather a restless and impatient nature, and in consequence of this impatience, pouring hot water on the blue vitriol, and in order to hasten its solution stirring it about until nearly ready for use, I know not. Of course, during that process, I inhaled the copper vapour in quite sufficient quantity to curdle any sweet milk I might have had in my stomach. Yet I was perfectly unmindful of that, and not being afraid to put my finger in the pie, as they say, I would often make use of the forceps of Adam instead of a glass stick, and at length I began to feel uneasiness between my shoulders, with head-aches, (to which I am not subject) shivering, and occasional pain in the epigastric region. I am naturally yellow, but I became pale, and experienced what the French call "vertigo," with prostration of strength and dimness of sight: but this is not all; the nervous papillæ of the tongue became tumefied and horribly annoying, I first thought that I had scalded my tongue with a mouthful of hot broth, and I armed myself with patience in the hope that time would relieve the inconvenience, but it was not so; the evil increased rather than abated, and the tongue became ulcerated in the centre, and considerably swollen on each side; and it was furred as if a "tartine" of spermaceti ointment had been nicely spread over it; the fauces also became tumefied and inflamed, while the soft palate, or roof of the mouth became coated with petechiæ, resembling the measles; and with that tumefied gums and slight ptyalism. Being also engaged in Daguerreotype experiments, I thought of attributing all this to the influence of iodine, which I also freely handled.

I was at last obliged to suspend my experiments, and use all possible remedies to restore my impaired health. Having probably and fortunately escaped the deleterious effects of copper, I thought I might renew my experiments, and although I had observed that after having washed my hands three or four times the water became blue from the system being contaminated with that mineral, yet I was more inclined to think I was under the influence of iodine rather than copper, although I often felt a copperish, cold, subacid taste, particularly in opening my mouth to inspire fresh air, the oxygen of which, perhaps, formed with it an instantaneous oxide of copper, communicated to the gustatory nerves, or nerves of taste. I dissolved only two or three pounds of the salt of copper in the usual way, and on the second day of my electro-chemical amusement I began to feel head-ache, and uneasiness about the fauces and soft palate; first, the affection appeared on the tip of the tongue, but now it shewed itself as above.

With considerable itchiness, and feeling all of a sudden as if I was going to faint, I opened my surgery window, and, for the first time, I felt convinced I was labouring under the influence of that poisonous mineral. I then looked in my mouth and *saw* and *felt* that the just lost complaint was fast returning. I washed my hands, and *three* times the water in the basin became blue. I then determined on using more caution, regretting only the necessity of taking antidotes, one of which was pleasant enough, viz. syrups in quantities, according to the celebrated Orfila. But the physicky part I do not much like, for though I may like to prescribe a large dose to my neighbour, I like it better for him than for myself.

Should the above lines deserve your notice, as tending to prolong the lives of your scientific readers, pray insert it, and that I am yet spared to relate to you my very fortunate escape, thanks be to Providence.

Castle Street, Dover,
Nov. 11th, 1840.

* Communicated by the Author.

REMARKS ON THE HOMŒOPATHIC DOCTRINE OF HAHNEMANN, AND THE "MATERIA MEDICA PURA."

BY MR. YOUNG.

To the Editors of The Chemist.

GENTLEMEN,—As Homœopathy is a subject which may be considered rather foreign to a work expressly dedicated to Chemistry, Chemical Manufactures, and Pharmacy,—yet as it is not to be supposed that Chemists are mere automata, and do not desire to know the power and virtues of the medicines they compound, it is hoped the following meagre sketch of a science which is making much progress, may not be altoge-

ther unacceptable to the readers of the "Chemist." Your obedient servant,

ROBERT YOUNG.

Samuel Hahnemann was born at Misnia in Upper Saxony, in the year 1755. After completing his school education, he studied natural history, and natural philosophy, and proceeded to the University of Leipsic to prosecute the study of medicine. He had not long studied this art ere he became dissatisfied with its principles, and the various conflicting and contradictory opinions of its professors. He found every thing in this department obscure, vague and hypothetical, and resolved to abandon the medical profession. Having been previously engaged in the study of Chemistry, he determined on translating into his native language the best English and French works on the subject.

It was whilst engaged in this undertaking and in translating Cullen's Materia Medica, in 1790, that he was struck with the action of cinchona bark in fevers. He was anxious to ascertain its mode of action, and being at the time in the enjoyment of perfect health, he commenced taking internally the usual doses of that substance, and in a short time he was attacked with all the symptoms of intermittent fever, similar in every respect to those which that medicine is known to cure. Struck with this remarkable fact, a new and sudden light flashed upon the soul of the friendless student; he divined, as it were in a moment, the great truth which is the fundamental principle of homœopathy, viz. that "*Similia similibus curentur;*" but he did not stop here; he did not build up a rash theory; he took nothing for granted; he did not intrude his crude opinions upon the medical profession. Years of patient investigation and acute suffering passed over before he gave to the world an account of his discovery that substances "possessed an inherent power of exciting in healthy subjects, the same symptoms which they are said to cure in the sick." In 1796 he published his first article on homœopathy; a work on the Virtues of Medicine in 1805, and the "Organon" in 1810. He commenced as a public medical teacher at Leipsic in 1811, where with his pupils he zealously investigated the effects of medicines on the living body, which formed the basis of the "Materia Medica Pura," which appeared during the same year.*

In 1824 the Homœopathic doctrine was embraced by Rau, physician to the Duke of Hesse Darmstadt; by Bigelius, physician to the Emperor of Russia; by Stegmann, Hufeland, and many other names celebrated in medicine. The writings of Hahnemann have appeared in six different languages, and the "Pharmacopœia Homœopathica," contains a list of 311 medical men, who practice the art of medicine as taught by him. I shall endeavour to give a rough sketch of the most prominent facts connected with this doctrine, not with the notion that I am capable of doing justice to the subject, but merely to give an idea of the science to those whose reading may not have tended that way.

If a medical practitioner be asked the cause of apoplexy, he will tell you, determination of blood to the brain: ask him the cause of heartburn, his answer will be acidity at the stomach: and yet, methinks, a schoolboy might tell him that the determination of the circulating fluid must have some cause—that the acidity must likewise proceed from some other derangement. Hahnemann argues that all disease proceeds from derangement of the dynamic power or vital force: and the cause (that is, the mode in which external objects, exposure, &c., act upon the vital energy) must for ever be hid from the human intellect.

All medicines, when administered to an individual in perfect health, produce symptoms more or less perceptible; that is, they produce deviations from the normal state, or in other words, disease. If, for instance, a healthy person take a dose of rhubarb, does it not produce diarrhœa? Yet, what medicine so efficacious as rhubarb in a relaxed state of the bowels? If opium be given to any individual it will produce excitement, head-ache, &c.; yet opium is given as a sedative to counteract these symptoms. Mercury is a specific in syphilis; yet, when administered internally to healthy individuals, it produces ulcers, &c., so closely resembling those of syphilis, that medical men themselves cannot distinguish the difference. If cinchona-bark be administered to a robust man in perfect health, and persevered in for some time, it will produce all the symptoms of intermittent fever; yet bark is a specific in this disease.

The name Specific was given by physicians to medicines whose action was uniform and efficacious in certain diseases: there was no mistaking, no hesitation; the disease was ascertained, the remedy was prompt and salutary. Yet physicians did not understand the action of these remedies to which they gave the name of specifics; they were at a loss to account for the manner of their action. Hahnemann has discovered this mode of action; he has followed out the law of specifics, and, after patient study and attentive investigation, has ascertained that all medicines produce

* For most of the particulars of the life of Hahnemann, I am indebted to the preface of the Organon, written by Samuel Stratten, M.D.

disease of some kind or other, and that it is this property of producing disease which enables the physician to cure with them diseases similar to those they produce. Homœopathy is therefore the law of specificity extended so as to embrace all diseases, as far as our knowledge of Materia Medica will permit.

In proof of the above assertions I will mention a few facts, which will prove that medicine produces disease, and that the same medicine will relieve symptoms similar to those it produces.

I. Two plants of *Aconitum napellus* were procured in full leaf and flower; the leaves were separated from the stem, placed in a Wedgewood's mortar, sprinkled with cold water and beat into a pulp: pressure was employed, and one ounce of juice procured. This was mixed with an equal quantity of spirit of wine; after twenty-four hours the supernatant liquor was decanted. The liquor was then preserved in a well stoppered bottle, and marked, "*Spirituous solution of Aconite.*"

II. One ounce of the fresh root, cut into small pieces, and macerated in four ounces of proof spirit for six hours, filtered and preserved for use. Marked "*Tincture of the Root of Aconite.*"

III. One ounce of the fresh leaves was macerated in four ounces of proof spirit for four days, filtered and preserved for use. Marked, "*Tincture of the Leaves of Aconite.*"

"An assistant, whilst engaged in making these preparations, touched the tip of his tongue with the root of the plant, which excited an acrid taste, followed by loss of sense. Six minutes after, he was seized with violent pain in the region of the heart, increased by inspiration, which continued two hours.*

"A strong healthy female, twenty-four years of age, was seized with severe pain in the right side, extending to the shoulder-blade on inspiration or cough. This state followed exposure to cold a few days previous to the attack; the "Spirituous Solution of Aconite" was administered in doses of about 8 drops in water. The pain subsided after the first dose."

"A weak emaciated man was seized with severe pain under the scapula, which was aggravated by muscular exertion or a full inspiration; he was ordered to be cupped over the painful part, and subsequently to use purgative medicines, which he did without relief. Twelve leeches were afterwards applied, by which a large quantity of blood was drawn. The pain still continuing, the spirituous solution was administered with complete success as in the preceding instance."

"In a third case, where pain of the side existed, such as is generally denominated a *stitch*, it was promptly and permanently relieved by this solution given in minute doses."

It would occupy too much space to mention more of these cases, and besides, would not answer my purpose, as the doses are not Homœopathic, although they demonstrate the principle,—*similia similibus curentur.*

In my next communication I shall endeavour to explain that part of Homœopathy, which more nearly concerns chemists, viz. the mode of preparation of Homœopathic Medicines, their action, and the manner in which they are administered.

* *Vide* Stratten's Notes to the Organon.

ERRORS IN DR. THOMSON'S DISPENSATORY.

To the Editors of The Chemist.

GENTLEMEN, — Your correspondent's letter, signed J. H., which appeared in *The Chemist*, No. VIII. pointing out the errors which occur in Thomson's *Conspectus to the Pharmacopœias*, and passing a well-merited censure on Dr. A. T. Thomson for allowing the work to issue from the press without first taking care to correct the many mistakes contained therein, no doubt met the approbation of most of the readers of your useful Journal.

Allow me now to direct attention to the errors which are to be found in the ninth or last edition of the same author's London Dispensatory,—which ought to be a safe book of reference; and indeed, such are its pretensions; but in the present edition, some of the blunders are of such magnitude that ignorance of their existence would be likely to bring an establishment into disrepute, and may possibly be productive of unpleasant consequences.

What I believe is considered the leading feature of the new Pharmacopœia, is the adoption of the imperial pint, containing f ℥ xx, in place of the old wine pint of f ℥ xvi. Of this change it is very important that every person at all concerned in the preparation or dispensing of medicines should be acquainted; but what is apparently most extraordinary, the Dispensatory tells us that the f ℥ xvi is still the measure of the London College, and a table of the proportions of the wine gallon is also given, just as if no alteration had taken place, when in the same book, the weight of the substances in all the formulæ of the old Pharmacopœia which are retained in the new one is directed with the proper increase in order to meet the increase of f ℥ iv to f ℥ xvj which makes the

imperial pint. To impute the imperfection to ignorance would be absurd: the excuse probably is, that it was an oversight, but, to say the least of it, great neglect is evident. In addition to this the formulæ of the London and Dublin Colleges are confounded together, and must, without watchful care, be the cause of continually recurring mistakes. I mean that some of the formulæ of the London and Dublin Colleges are included together in the same paragraph, and no distinction made, the same as they were when the pints of both colleges were alike; now, if it be always remembered to use the f ℥ xx pint for both colleges, no mistake can happen where the weight and measure of both colleges were the same in the old Pharmacopœia, but in other formulæ where the weight of substances ordered by the Dublin College was, nor is, not the same as that ordered by the London College, and the difference is shown, in a parenthesis as it was in the old Pharmacopœia, when the f ℥ xvj was adopted by both colleges, error may probably ensue, because attention to this book renders it likely for a person to err in two ways; 1st, Supposing that from any other source he is made aware of the alteration in the measure, he is not reminded in the Dispensatory that the Dublin pint contains only f ℥ xvj, and he may use the f ℥ xx pint, which would make the London preparation right, but the Dublin preparation would be wrong; and 2d, Supposing him to be ignorant of the change in the measure, and using the f ℥xvj pint, the Dublin preparation would be correct, but the London incorrect. The formulæ for tinct. guaiac. may be referred to as an illustration of what is here stated.

In conclusion, I think it is a pity that a book which has been usually presumed to be pretty correct, should be chargeable with the imperfections which disgrace the Ninth Edition of the London Dispensatory, imperfections which are undoubtedly calculated to mislead and deceive.

I am,
Gentlemen,
Your obedient humble Servant,
P. H.

ON THE FORMATION OF MERCURIAL OINTMENT, BLACK WASH, AND BLUE PILL.

BY MR. JOHN MACKAY, EDINBURGH.

To the Editors of The Chemist.

GENTLEMEN,—Observing a communication from one of your correspondents, in the last number of your journal, regarding the killing of mercury, I would take the liberty of offering you a few remarks on the subject.

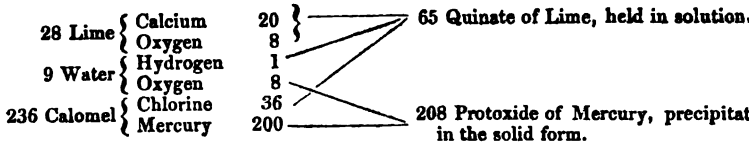
The formation of the mercurial ointment and pill, has long been a source of discomfort to all connected with the laboratory: the patience of both porter and apprentice has been frequently exhausted, from the continued rubbing requisite to render the combination perfect. Numerous methods have been recommended for facilitating the production of the ointment.

Your correspondent has stated the objections as urged by Mr. Phillips, against the use of either ol. sulphuræ, or the spirit. terebinth. But there is, I think, nothing which seems to diminish the labour attendant upon the production of this compound, so much as the use of a portion of old ointment. It certainly possesses this advantage, that it is not at all objectionable. Mr. Phillips mentions this in a cursory manner, but it has been neglected by your correspondent, because the why and wherefore are not given.

There exists a mystery regarding this mercurial preparation, and it is as yet uncertain to what salt it owes its power; yet it will be found, that the addition of a portion of old ointment, will greatly facilitate the production of an uniform compound.

To attempt to arrive at any thing like a satisfactory conclusion, with regard to the existing compound in the ung. hydrarg.—the question at first sight would be, what salt is formed by rubbing together the metal and fatty matter? This might readily be answered, by stating the generally received opinion,—that the protoxide of mercury is the exciting agent. This is plausible enough, since we know that the minute division of the metal, and the presentation of the particles so frequently to the action of the atmosphere, are favorable to oxidation. But, on the other hand, this theory is in a great measure refuted by the simple fact, that an ointment, formed by mixing the carefully prepared oxide with lard, does not produce the same strong effects as the blue ointment.

It is even yet a matter of doubt, as to the active preparation in the black wash. This lotion is much famed for its healing virtues, and which general opinion ascribes to the oxide of mercury. There are some, however, who differ upon this point, and declare the beneficial results of its application to arise from the stimulating property of the muriate of lime, which is formed by the decomposition of the calomel. The following diagram will better illustrate this. We take the ingredients in their atomic proportions:—



Now the muriate of lime present, as shewn by the above, is almost entirely overlooked, when speaking of the action of the *lotio nigra*. We know that the oxide of mercury applied moistened to a sore is nearly inert, but possesses a very different power when combined with the *murias calcis*. From this might we not argue, that good effects may be produced by using the solut. mur. calcis alone? It certainly would be more cleanly in its application than the old lotion. The London College, in their formula for the preparation of the strong mercurial ointment, direct that suet be first employed to kill the quicksilver. From this it would appear to me, that as sebacic acid is contained in large quantity in this substance, that a sebate or sub-sebate of mercury may be formed. And as this acid is also present in rancid lard, in greater proportion than in fresh, may it not explain, why fat partially in this state hastens the formation of the ointment, and why, during the trituration this rancidity partially disappears? Not that I would come at once to the conclusion that it would be prudent in every case to use spoiled lard for the purpose of making this ointment, but think it is a matter for investigation. But may not the old ointment act in a similar way? If, by keeping the ung. hydrarg. for some time, more sebacic acid be formed, may not its combination with the metal be the means of hastening the operation? I have been told that some use rancid lard, from the circumstance of its combining with the mercury more readily than the new. If, however, the old ointment answer equally well for this purpose, it would be better to employ it.

Dr. Duncan, in speaking of this preparation, says: "proposals have been made, for diminishing the labour, but they are in general hurtful to the efficacy of the preparation, except, the addition of a portion of *old mercurial ointment, which, like a ferment, promotes the formation of the new.*" This language is somewhat obscure, but tends to support the theory which I have advanced.

I am also inclined to suppose, that in the preparation of the blue pill, much is dependent upon the quantity of free acid present in the fruit of the conserve employed.

At the present time, when the greatest difficulties are being surmounted, this particular part of chemical manufacture has not been overlooked. Some wholesale drug establishments have got mercurial mills erected, for the purpose of making blue ointment and pill mass. It is now some time since I have seen one of those mills in operation, but from recollection, the following appeared to be the construction:—

A deep groove is cut in a solid, circular piece of marble, into which dip four metallic handles, all connected to one rod, which is moved by the engine, and serves to make the arms revolve within the groove. Placed before each arm, are four large balls, of a sufficient size to move easily within the space. If the circle be not large, three arms and balls are substituted for four. When in operation, the materials are placed within the groove, and by the motion of the arms the balls are trundled gently forward, and this operation goes steadily on, until the combination is complete. The expense of erecting a mercurial mill, where a steam engine is employed, as for moving grinding stones, sifters, &c. must be inconsiderable. It may also be erected at such a distance from the machinery, as to obviate the principal objection hitherto urged against its use, namely, the great heat always thought unavoidable where machinery was employed, and which of course would liquefy the fatty matter, and prevent the preparation of the ointment.

I fear that I have trespassed upon your valuable time and space, but the question is one of such an interesting nature, as to demand some enquiry.

I have the honour to remain,
Gentlemen,
Your most obedient Servant,
JOHN MACKAY.

Edinburgh, 13th Nov. 1840.

KILLING OF MERCURY.

We have this month received many communications on this subject, from which we select the following, being all that we have room for at present:—

GENTLEMEN,—I beg leave to offer to "A SUBSCRIBER" the following hints respecting the "killing of Mercury, as he wishes to know the best mode of killing—say six pounds at a time."

Mercury has not a very willing affinity

for lard, without much tedious trituration; however, their union is greatly promoted by the addition of old mercurial ointment, as my experience has proved the fact for the last ten years. Dr. Stratten, of Dublin, in his Lectures on this article, recommended this plan, and I have ever since found it to save much time and trouble; I may almost say, that a small quantity may be made by this plan, in as many minutes, as could by the old plan in so many hours.

I can only offer a conjecture as to why a portion of old ointment facilitates the division of the mercury, since it remains a disputed point as to whether the mercury in the ointment is in a state of minute subdivision, or in a state of oxidation. Whichever way it acts, the fact is certain that old ung. hydrarg. will very quickly disperse and absorb the particles of fresh mercury, whereas it would take a very long time with fresh mercury and fresh lard alone to do it.

For making six pounds of ointment, I would recommend half a pound, more or less, of old ointment to be put in the mortar, to which add all the mercury that is intended for the six pounds; these are to be well triturated together, gradually adding small portions of the fresh lard, until one pound is added—the trituration must be kept on until no globules can be discovered, which may be tried by besmearing a small portion of it upon white paper with the finger; if it be sufficiently comminuted, not the least globule of mercury can be seen by the eye, nor even by a magnifying glass. (Unless this point is attended to, the mercury is only wasted, and the prescriber disappointed in its effects.) Then the remaining portion of lard is to be added, to be well and equally mixed with the rest, and the operation is finished.

The reason why I would not use all the lard at once is, because it is, not only unnecessary, but its absence facilitates the labour and difficulty of using the pestle; besides, when there is only a small quantity of lard in the mortar, the pestle presses upon a much larger surface of mercury than if it contained much lard.

As to the theory of its combination with the lard, I would presume that the following has a degree of plausibility: As mercury is so easily oxydized, it is probable that a partial oxydation takes place during the process of its subdivision and trituration; and I shall produce a fact which tends to prove that a chemical change has taken place, between the mercury and the lard, and that is, the peculiar smell of ung. hydrargyri. The crude mercury has no particular smell; the lard, again, unmixed, has nothing of the smell of that ointment: then I conclude: that something more than a mechanical change has taken place during the process of "killing" this mineral. I am, sir, your obedient subscriber,

CORVENIUS.

Corwen, Nov. 10, 1840.

KILLING OF MERCURY.

To the Editors of the Chemist.

Gentlemen,—In answer to the request of one of your subscribers, respecting the Killing of Mercury, as it is called, I beg to trouble you with the following remarks, taken from a Weekly Medical Paper:—

The Modus Operandi is to divide or oxidize the silver with oxygenated stearine. This article is found in its purest and best form in the London Stearine Mould Candle. Why in the London Stearine Mould Candle? Because it is made of the best mutton suet, washed, and then pressed; the oleine exuding, the stearine is then exposed to the atmospheric air, and made into candles, and in this state it is ready for use. You will probably say, "Why not prepare it yourself in this way?" My answer is, it is impossible to procure the same article but by the same extensive and tedious process, and when you can obtain it so readily in this form, it would be a work of supererogation. I might as well attempt to make Barclay's porter in a tea-kettle.

The process and formula are as follows:—Take stearine (London Mould Candle), separated from the wick 5j., rub it until it assumes the appearance of cold cream; then add 3iv. of quicksilver, and in ten minutes it will be effectually reduced; the hog's-lard may then be added, according to the strength required.

The Pil. Hydr. and Hyd. cum Creta may be made in the same way. The stearine does not interfere in the slightest degree with either the effect or appearance of the preparations. These remarks are well worth the attention of your correspondent.

I am, Gentlemen,
Most respectfully yours,
A CONSTANT SUBSCRIBER.

Dartford, Kent.

N.B. Having made *all* the above articles, I shall be happy to answer any question for the information of your readers.

CURE FOR GOUT.

To the Editors of The Chemist.

Gentlemen,—Although you may be startled by the announcement of the discovery of a cure for gout, I can nevertheless assure you of the fact that such a discovery has been made, and that it consists in the external application of Sp. Sal. Volat. (Sp. Ammon. Arom.) to the part affected.

If it be objected, that there can be no cure for gout, seeing that at longer or shorter intervals it may return, I answer that, upon such grounds, sulphate of quinine might be objected to as a cure for ague. Waiving, therefore, such objections as unphilosophical and contrary to experience, I will at once proceed to describe the manner of making the application of spirit of sal volatile, which consists merely in gently rubbing it with the hand on the gouty member. In a few minutes the pain will be assuaged, the inflammation will speedily subside, and, in due course of time, the swelling disappear. As often as the pain returns, the application must be repeated, till the paroxysm is at an end. I scarcely need premise, that attention must be paid to the state of the bowels.

Gentlemen, I leave to you the explanation of the *modus operandi*, upon chemical principles, my object being merely to obtain for this discovery a place in your valuable work; conceiving that thereby the greatest benefit to gouty sufferers will arise, inasmuch as it will thus be brought under the immediate notice of the scientific world.

I will add only that, so far as my experience goes, no danger can arise from the spirit of sal volatile, which is not a repellant, but simply a chemical agent.

I am, Gentlemen,

Your most obedient humble servant,

A Friend to the Gouty.

7th November, 1840.

NOTE ON CREOSOTE.

FROM A CORRESPONDENT.

Some of your readers may, perhaps, have noticed the fact I am about mentioning, and may be able to explain the cause thereof,—viz. that creosote, on long standing in the light, gradually becomes discolored, until it eventually assumes a dark brown colour, and is thereby deteriorated in its peculiar properties. It is well known that the rays of light have quite the reverse effect in decomposing most fugitive vegetable colours on exposure to light; in some instances even in a very few days.

SAPONIFICATION OF A HUMAN CORPSE.*

In the cemetery of Cluny, near Lyons, a body has been found in a well-preserved state of saponification. The muscular or fleshy parts were white, hard and compact, like soap, of which they had all the appearance. They were soft to the touch, like talc or spermaceti, and presented no traces of vessels, nerves, or tendons: all was homogeneous. The heart, which was quite intact, was a complete saponaceous mass. The non-muscular viscera, such as the lungs and intestines, were shrunk to a twentieth of their ordinary size. The head, which doubtless was not surrounded, like the other parts of the body, with a bed of earth favorable to its preservation, was very much decayed. The eyes, the nose, the ears, &c., were reduced to dust. Some hair, in its original condition, was lying on the winding-sheet, which was mouldy or decomposed; this hair could be collected in parcels.

* *Journal de Chimie Médicale*, Oct. 1840.

FORMULA FOR A SEDATIVE APPLICATION IN CASES OF OBSTINATE HEAD-ACH, CONGESTION AND CEREBRAL FEVER.*

BY M. RASPAIL.

Liquid Ammonia . .	100 grammes.
Distilled Water . .	900
Purified Sea Salt . .	20
Camphor	2
Essence of Rose . .	Q. S.

The whole to be dissolved cold.

Mode of use.—A cloth is dipped in this water, and is applied immediately over the part of the cranium which the patient points out as the seat of pain, taking care that none of the liquid runs into the eyes, which may be prevented by a bandage over the eye-brows.

The sedative effect almost instantaneously takes place: even head-aches of intolerable violence, accompanied by photo-phobia and retraction of the eyeballs have disappeared after a quarter or half an hour; and on the simple application of a cloth once dipped in.

The cloth is dipped in every time a new attack seems to be threatened, and left on the head until it is necessary to steep it *de novo*.

PRESERVATION OF CANTHARIDES.†

BY M. RIQUET.

At the season of gathering cantharides, I think it my duty to make known a method of killing them, which I have not seen described any where. This method, which is very simple, consists in putting them in a bottle or other vessel hermetically close d and in thus exposing them for some hours to the sun. The fuller the vessel is, the sooner asphyxia will take place; it will be

* *Ibid.*, Oct. 1840.

† *Journal de Chimie Médicale*, Oct. 1840.

produced sooner by elevation of temperature. When it is desired to operate quicker, a few drops of ether may be put in the vessel.

By operating in the above manner, it seems to me that they are more easily preserved than by means of vinegar.

HUFELAND'S ANTI-VOMITIVE MIXTURE.*

R. Tincture of aloes } ā ā.....3·18 gram.
Tincture of castor }
Tincture of orange peel.....6·36 „
Mix: *for internal use.*

Hufeland has recommended this preparation in chronic vomiting owing to atony of the stomach, especially in hysterical persons.

Fifteen drops to be given in the morning, at noon, and at night.

Each dose is to be administered in half a cupfull of a weak infusion of fennel seed, properly sweetened.

DR. PLISSON'S SEDATIVE POWDER IN CASES OF NEURALGIA AND CHRONIC RHEUMATISM.†

R. Muriate of morphia .....0·30 gram.
Camphor, in fine powder } ā ā 2·00 „
Castor or saffron ..... }
Aromatic spices.....25·00 „
Mix and label it:—*Powder for external use.*

Sprinkle with this mixture a new and well heated flannel, with which the affected parts are to be covered: renew this application morning and evening.

The action of this topic should be assisted by a few cups of a weak infusion of black tea, Roman camomile, orange flowers, or a little sage.

For more than ten years Dr. Plisson made frequent use of this powder, which he has found very beneficial in many cases.

ON THE EFFECTS OF EXTRACT OF HYOSCIAMUS, AND ON THE MEANS OF COMBATING THEM EFFICACIOUSLY.‡

BY SIGNOR MEDORO.

Signor Medoro gives an account of four cases in which extract of hyosciamus produced identical symptoms. These symptoms seem to have borne great analogy to those of mental alienation, and consisted of spasmodic contractions of the muscles of the face and of the lower jaw, and of twitchings of the tendons. After all the antispasmodic and antiphlogistic routine of treatment had been tried in vain, lemon juice was exhibited, and all the symptoms very soon abated.

ON THE THERAPEUTIC EFFECTS OF CROTON OIL IN CERTAIN AFFECTIONS OF THE NERVES.†

BY DR. NEWBIGGING.

I observed that for some time the only action it was supposed to possess on the animal economy, was that of active purgation, until Sir Charles Bell pointed out its effects on neuralgia. Not that it would be found to remove the affection in all cases, which was impossible in those depending on certain organic changes. He then detailed a number of cases to prove that it possessed a specific power over the nervous system, independent of its general action as a purgative. The diseases in which the power was exhibited were severe sciatica, which had baffled every other treatment; convulsions in children, and epilepsy, many cases of which it cured; and even in those depending on organic affections of the brain, it rendered the paroxysms less frequent and more moderate. In a case of severe laryngismus stridulus occurring in a child nine months old, Andral exhibited it in minute doses with complete success.

Dr. Abercrombie said he had long used it extensively in affections of the head, and from his experience of it he thought it might possess specific power over the nervous system. As the disease laryngismus stridulus was alluded to, he would mention a remedy he had found very valuable in its treatment, which was a combination of carbonate of iron and rhubarb with musk.

Sir C. Bell had found several forms of severe neuralgia, particularly occurring in the extremities, as in the finger or toe, over which croton oil had no power. It was in facial neuralgia that it proved most serviceable, or in neuralgia occurring elsewhere, accompanied by some indication of cerebral affection. When he considered the great extent of the intestinal tract, and that those diseases may depend on sympathy with different parts of it, he was prepared to expect

* *Journal des Connaissances Médicales*, July 1840.
† *Ibid.*
‡ *Il Raccoglitore Medico.*

† *British Association, Medical Section*, Glasgow, 1840.

the necessity of using different purgatives which were known to act principally on different portions of the intestines.

ON THE PROPERTIES, CHEMICAL AND THERAPEUTIC, OF THE MATIAS BARK.*

BY DR. M'KAY.

The plant from which the bark was obtained, he stated, grew in great abundance in South America; but he was unable to state its botanical characters. From what he had heard he supposed it to belong to the genus Wintersonia. In its native country it was extensively used as a substitute for cinchona bark in intermittents. It was found to contain an intensely bitter extractive matter, to yield on distillation two distinct essential oils, differing in specific gravity, soluble in alcohol and ether, but very sparingly so in water. The principal characteristic substance derived from it was a bitter resinous matter; no alkaloid was discovered to exist in it. Specimens of the bark, its extract, the essential oils, tincture and resinous matter, were exhibited. The principal therapeutic properties were stated to be tonic, aromatic, and astringent. Dr. M'Kay also stated that it had been exhibited with marked success in dyspepsia accompanied by loss of appetite, which it quickly restored,—in phthisis, where tonics were admissible, in which it supported the strength, and prevented rapid sinking; in dropsy it was found to be a valuable adjunct to diuretics; in intermittents it was found to be a valuable substitute for cinchona. It was also found serviceable in such cases of hemicrania, as permitted the use of quinine.

Dr. Newbigging, from extensive use of the drug, corroborated the statement made of its therapeutic virtues.

ON THE MEDICINAL ACTION OF BROMINE AND ITS COMPOUNDS.†

BY DR. R. M. GLOVER.

The principal conclusions from the experiments made to ascertain its physiological action, were as follows:—

Whether bromine be taken into the lungs in the form of vapour, or into the stomach in the fluid form, or be injected into the circulation, it acts purely as a corrosive and an irritant; the action on the primæ viæ is different from that of hydrobromic acid, into which bromine is converted when absorbed into the circulation. The author extends this observation by analogy to chlorine and iodine, and their hydracids.

Bromine exerts an action on the rectum like that of iodine; it is also tonic and diuretic; its remedial virtues are chiefly conspicuous as an external application in the treatment of scrofulous, syphilitic, malignant, and specific ulcers; in these cases, it appears to act as an excitant, and perhaps as a mild caustic; it is also useful in some chronic diseases of the skin.

The bromides of potassium, sodium, and mercury resemble much more the chlorides of these bases than the iodides, in their physiological action. The bibromide of mercury has no advantage over the bichloride as a remedy, contrary to what has been asserted by some French writers. The bromide of cyanogen possesses a double action; in a powerful dose it operates like prussic acid, in a moderate one it produces the most violent symptoms of irritant poisoning, and is the most powerful irritant known. Ammonia is its best antidote.

The chlorides and bromides of olefiant gas exert a remarkable action, introduced either into the stomach or circulation: in the former they produce, in a large dose, death by coma, in a smaller dose, loss of power over the voluntary muscles, sensibility being retained, with difficulty of respiration, from effusion into the lungs; in the latter, when injected in a large quantity into the veins, they cause almost instant death, producing great congestion of the lungs, and destroying the irritability of the heart; in smaller doses death is produced in the same manner as by their introduction into the stomach.

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* *British Association, Medical Section*; Meeting held at Glasgow, Sept. 1840.

† *British Association*: from *The Athenæum*.

TO CORRESPONDENTS.

Our Subscriber is referred to our advertisement on the cover.

E. W. will find an article on Morphia by Dr. Mohr, at page 361, which will answer his purpose.

We are obliged to P. T.

Nota Bene.—*All Communications and Books for Review must be addressed, "To the Editors of The Chemist, care of Mr Hastings, Publisher, 13, Carey-street, Lincoln's Inn Fields, London." Communications must be pre-paid, and sent before the 15th of each month.*

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17	2	9 from bottom (p. 16, c. 2, l. 16 from top), *for* "arsenic" *read* "acid."
*33	2	11 from bottom *for* "C^4 H^6 O^2," &c. *read* "C^4 Cl^6 O^2," &c.
41	2	17, before "exist"—insert "not."
77	1	19 from bottom, *for* "evils," *read* "oils."
89	2	33, *for* "alkalies"—*read* "acids."
93	2	20 from bottom, *for* "Saline Helise," *read* "Salix Helix," and, following line, *for* "Salinise, *read* "Salicine,"
116	1	15, *for* "blue, *read* "green."
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141	1	25, *for* "distilled," *read* "dissolved."
211	2	25, *for* "iodide," *read* "iodine."
288	1	10 from bottom, *for* "ā ā gram. 0·00," *read* "ā ā gram. 0·50."
338	1	26, *after* "quantity of." *insert* "hot water."
339	2	11, *after* "poet," *insert* "Αριστον μὲν ὕδωρ."
342	1	13, *for* "sulphate," *read* "sulphite."
344	1	4, *for* "Serum," *read* "Sevum."
345	2	15, *for* "Sacc. Elycynh.," *read* "Succ. Glycyrrh."
345	2	15, *for* "Elycynh. pin," *read* "Glycyrrhpur."

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THE CHEMIST;

OR,

REPORTER OF CHEMICAL DISCOVERIES AND IMPROVEMENTS,

AND

PROTECTOR OF THE RIGHTS OF THE CHEMIST AND CHEMICAL MANUFACTURER.

EDITED BY

CHARLES WATT, ESQ.

LECTURER ON CHEMISTRY,

AND

JOHN WATT, JUN.

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INTRODUCTION.

We have now fulfilled our engagements with the public for the past year; and a year in the science of Chemistry at the present time is an epoch, in comparison with the like period previous to the discoveries of Black, Cavendish, Priestley, Lavoisier, Davy, Watt. None who are acquainted with the works of those illustrious men can fail to trace to their labours that total revolution, from vague hypothesis and chimerical conjecture, to sound theory and accurately defined laws which now supply their place in that science, the most extended in its range of objects, and the most important in its application to the arts of man. Nothing surely can be wanting to shew the value of their services to mankind but the mere record of their researches in Light, Heat, and Electro-Chemistry; the discoveries of Hydrogen, Oxygen, and Nitrogen as simple bodies, as the elements of water and the atmosphere, and as affording satisfactory explanations of the phenomena of respiration and combustion; of the composition of the Alkalies and Earths, and the development of the character of Chlorine; the researches on Nitrous Oxide, and the invention and perfection of the safety lamp by the transcendent power of that chief of Chemists who has left behind him so many proofs "to give the world assurance of a man;" the construction and varied application of the steam-engine by the immortal Watt, needs from us no comment—it is sufficient to conclude in the words of Black, that it is "the noblest gift of philosophy to the arts."

Since the time of these men, whose "works are their best monument," what rapid progress has it not made; nay, indeed, we may add, what daily progress is it not making! Let us only refer to the beautiful applications of the Daguerréotype to the fine arts, by which in a few minutes correct likenesses can be taken with the perfection of nature, instead of the mawkish flatteries and crudities of art. Not less valuable, though perhaps less astounding, is the process of Electrotype, by one application of which is superseded one of the most destructive and dangerous manufacturing operations of any employed in the arts. The use of mercury in the processes of gilding and silvering is for ever exploded by the simple aid of solution and electric action.

In the once hopeless and gloomy paths of organic chemistry, the discoveries are now equally important and valuable. The labours of CHEVREUL, FREMY, BOUDET, POUTET, COUERBE, and particularly LIEBIG, manifest the highest adaptation for research, and the most unexampled success in its application: by the works of the latter this branch of the science may with truth be said to have reached an equal degree of advancement with the chemistry of inorganic matter, and presents the highest prospects of far greater extension. The present period seems one in which discoveries are of such frequent occurrence, that one of an ordinary nature produces but little effect or surprise: it now requires something totally unexpected, and even beyond ordinary conception, to produce any excitement among men of science: such a period, then, is, of all others, that in which to prosecute the study of Chemistry, and to encourage diligent application and thorough knowledge of its facts and doctrines, in those who are about to engage in its pursuits; and firmly are we convinced that such study will prove as beneficial to themselves as to society.

In the section devoted to CHEMISTRY, we have published valuable communications from scientific contributors, amongst whom we may mention as deserving of our thanks, MR. HILEY, of Elland. We have also given translations of the most laborious, interesting, and important labours of our continental brethren, whose additions to our knowledge during the present year have been very numerous. To mention all, or even many of them in this place, would be unnecessary, if practicable. Still there are some which must not pass unnoticed: such as M. BIOT's "Memoirs on Atomic Chemistry;" "Investigations concerning the Composition of the Brain of Man," by M. FREMY; the "Investigations concerning the True Atomic Weight of Carbon," by MM. DUMAS and STASS (made in 1840) are, perhaps of greater importance than any other articles in this volume. M. PELIGOT has furnished the scientific world with the results of some very elaborate "Investigations concerning Ulmic Acid and Uranium," which he has proved to be not a metal, but a metallic oxide, from which he obtained metallic uranium. M. JACQUELAIN has also given us some valuable information concerning the "Elementary Composition of Certain Species of Anthracite." M. BOUSSINGAULT's paper, "On the Composition of the Air which is found in the Pores of Snow," and his "Researches," in conjunction with M. DUMAS, "as to the True Composition of the Atmosphere," are most valuable contributions to Chemical Science. There are also most important papers, by M. LAROCQUE

"On Gallic Acid;"—by MM. BOUTRON-CHARLARD and E. FREMY, "On Lactic Fermentation;"—by M. PELIGOT, "On the Atomic Weight of Uranium;"—by M. CAPITAINE, "On the Atomic Weight of Iron;"—and by M. THIERRY, "On Guaiacic Acid, and on Extract of Guaiacum;" with many others, for the excellence of which the following names, which form but an inconsiderable part of those which grace our work will be a sufficient guarantee:—BUNSEN, GREGORY, BUCHNER, ETTLING, HARE, PLAYFAIR, JOHNSTON, VOGEL, GERHARDT and CAHOURS, R. F. MARCHAND, THOMSON, KUHLMANN, VON KOBELL, LAURENT, LANGLOIS, PERSOZ, LIEBIG, H. ROSE, A. ROSE, MITSCHERLICH, GAY-LUSSAC, PELOUZE, DANIELL, BROWN (DR.), GIRAULT, PELLETIER, LASSAIGNE, WÖHLER, BROMEIS, TILLEY, DEVILLE, &c. &c. &c.

In the section of CHEMICAL MANUFACTURES less has been published; but still the articles will be found of great utility and of the highest importance; we do not see any necessity for recapitulating them here.

"PHARMACY" has been chiefly devoted to the all-engrossing topic of Medical Reform. The formation of a Pharmaceutical Society is, perhaps, one of the greatest events of the year:* but the Council invested with the management of the affairs of the Society has rendered it perfectly unavailing to provincial druggists, nor does it appear to us to be much more beneficial to metropolitan ones. This Society, on its first formation, had our support, which we soon found ourselves obliged to withdraw. In this section, many communications from correspondents on the subject of medical reform are given. This department also contains much of a scientific character that will prove useful to the pharmacopolist.

The pages of THE CHEMIST forming, as they do, an organ of communication of all the improvements in the science, and its application to the arts and manufactures, as well as of all that is new in Pharmacy, bring before the Chemist a record, enabling him to keep pace with the progress of these important subjects; and we have too extended sources of knowledge of the high opinion of the manner in which the performance of our duties is estimated by the profession and the public, as well as from the circulation of the work, not to be satisfied that such a medium as THE CHEMIST is, of all the others, best adapted to assist the student, and to forward the views of the adept.

Although during the present year there have not been made, either in this country or on the continent, any discoveries of great importance, still,

* The Pharmaceutical Society is a sad, but apt, illustration of the saying—"Parturiunt montes, nascetur ridiculus mus."

have we had to record many valuable additions to our knowledge, and to our resources of industry in the arts and manufactures. The cultivation of chemistry by those who are engaged in dispensing Medicine, as well as a more extended knowledge of Pharmacy will, we are as confident as we shall be rejoiced at its existence, be compelled by an act of the Legislature, made to re-organize the profession of Medicine, and to remedy the sad catalogue of abuses, which have so long prevailed, and are so congenial to certain classes of its members. That this profession must be reformed, is too evident; but the question is, how? To enable apothecaries to take fees, as well as keep chemists shops? To prevent chemists from dispensing to the poor a simple remedy! To perpetuate the infamous power of excluding from professional right and rank all except such as are educated by themselves, or rather, we should say, such as have paid them for education? To these questions our reply is, No;—but by a thorough reform in the system of education, examination, and by throwing open the means of obtaining qualification to all, wherever taught, so long as they are proved worthy of the trust. That an efficient act, therefore, for the regulation of the whole profession will next Session pass the Legislature, we are confident; and in every stage of its progress we shall devote our utmost attention and vigilance to guard the profession against any unfair encroachments of its different ranks upon each other, and the public from the perpetuation of ignorance, cupidity, and disgraceful practices.

Among other improvements which we hope soon to see made in the medical profession is the compulsion to obtain a far greater amount of chemical knowledge than is now done. It is easy to show its general importance to medical science, and this is by no means confined to pharmaceutical chemistry. We contend that it is of infinitely greater importance than has generally been allowed by physicians, in relation to physiology and pathology. The chemical composition of the different parts of the body, and the actions by which they are affected and maintained, are, indeed, subjects of the highest importance to the medical practitioner, for on these must depend their functions, and any changes in their frame must reciprocally produce corresponding ones in the latter. We are astonished that its relation to pathology should not long since have been made apparent to them. Many subjects of the most grave inquiry present themselves to our notice, which we cannot but view with the greatest interest, as vitally connected with morbid action. In the first place, is it not of the highest consequence to endeavour to trace the influence in the composition of the various parts in health and disease?

We have found the brain, the muscular &c. structure, the liver, spleen, and the various secretions, the blood &c., totally changed in their chemical composition from that of their healthy state. Surely these subjects are well worthy the study of the physiologist and the physician, and much more likely to benefit the learners than the ravings of homœopathy.

In the past year of our exertions in supplying matter worthy the attention of our readers, we have kept in view our original engagements; viz., to present them with all that is new in Chemistry, Chemical Manufactures, and Pharmacy, and have likewise exerted our best—and we have good reason to congratulate our readers and ourselves that they have been successful—efforts in protecting the rights and privileges of Chemists and Druggists from the encroachments of the Apothecaries, the machinations of the Medical Association, and the trade from total destruction by hasty and ill-devised measures brought before the House of Commons, and so handsomely withdrawn by Mr. Hawes, when he found a certain clause bear unexpectedly heavy upon them. We fear, nay, we are certain, that their interests will not be in better hands in the next Session, and we must arouse their attention in time.

That our matter during the year has been of the most interesting and instructive kind can admit of no doubt; we have detailed researches and discoveries not found in any of the more elaborate works of chemistry, since published by men of the highest eminence, both in this country and on the Continent.

In Manufactures we have detailed all that was new and worth recording, including original papers of great interest and importance, as tending to simplify processes, to improve our commerce, and to increase our sources of industry and employment.

In Pharmacy we have added much that is of importance, and more especially have we used every exertion to expose and prevent the disgraceful practice of adulteration of drugs, so extensively practised among the lower grades of the Chemists and Druggists, and those who follow the disreputable practice of marking their spurious articles with tickets of their prices, which are low only in proportion to their adulteration.

In all the sections of this Journal, and in conformity with our engagements with our readers, we have fully kept in view the objects of the work, and we have received the most ample encouragement from the public, and the highest testimonials of approbation from the press in all parts of the United Kingdom and elsewhere.

In conclusion, we shall continue our earnest recommendations to our readers, and particularly to all who are engaged in medicine, to obtain a perfect knowledge of chemistry, as being of the highest importance to their professional eminence and reputation, which we can safely predict will rise in exact proportion to their acquirements of its various facts and laws. No science is so universal in its extent: it is concerned in all the minute changes taking place in all the forms of matter; there is no atom, however small, which is not subject to chemical action, and there is no combination which is not the result of affinity, and no simple body which cannot be combined, nor compound which cannot be resolved into its simple elements. Surely, then, that science which teaches the nature, causes and changes which take place so universally and constantly between the particles of matter in its states, either of inorganic or organic existence, must, of all studies, be the most interesting and important to promote its cultivation and diffusion.

Our best exertions will ever be made during the next year: no pains will be spared to procure such subjects as are most valuable to our readers, who, we trust, will view the acquisition of knowledge, like that of riches, as begetting a desire for it in exact proportion to the possession of it: none need fear to obtain the knowledge of any science if he desires it; and he who wishes it, will be certain to gain it by study and application, verifying the words of Isocrates,—"Ἐαν ἧς φιλομαθὴς, ἔσῃ πολυμαθὴς."

THE CHEMIST.

ADVERTISEMENT.

In commencing another year, we feel bound to make our best acknowledgments to our numerous subscribers for their encouragement of The Chemist, and likewise to our contemporaries, for the liberal and very handsome manner in which they have recognized our labours. Stimulated by such marks of public approbation—the best rewards of a journalist, because they are the most solid—and under the cheering auspices of the most extended patronage and extraordinary and increasing sale since its first appearance, we pledge ourselves to unceasing exertions to render the work still more worthy of their support, by supplying much original matter,—by having recourse to all the best foreign sources,—and by the most vigilant guardianship of the interests of our brethren. In short it will continue to rise in interest as it advances in favor and circulation, making it manifest that merit—

"Grows with their growth, and strengthens with their strength."

The Science of Chemistry is one of peculiar interest; none embraces so wide a range of objects;—involving, as it does, an acquaintance with the laws, properties, changes and combinations of the particles of matter, it is by far the most comprehensive of all the branches of human knowledge.

But Chemistry is not confined to the mere development of the laws which regulate the actions of particles, nor to the revelations of abstract scientific truth; it is, if we may so speak, the parent of the chief arts necessary to the very existence, and mainly contributive to the comforts and luxuries of civilized man.

Where would be the resources in the great art of Medicine, were it not for the productions which are founded in Chemistry? Take these from the Pharmacopœia, and this, now the first of all human studies, would at once become the feeblest of the arts of man.

In the great processes of bleaching, dyeing, calico-printing, tanning, brewing, distilling, glass and soap-making, mining, and the immense works for the production of the alkalies and acids,—such as at Stoke, Glasgow, and Newton, &c., — where can we find a single part of their varied operations which has not received all that is important towards perfection from this omnipotent science? Without its aid, these now exhaustless sources of wealth and industry would have been comparatively lost

to the world. Where would have been the resources of employment for the poor in the absence of the arts of pottery, china and glass making, whose wonderful productions, of articles of indispensable utility and matchless elegance are fabricated in a manner suited either to the cottage or the palace? Of these we may indeed say with Ovid—*Quæ prosunt omnibus artes.* What then must be the value of that science by whose aid these sources of industry are established, extended, and improved! But for the diffusion of Chemical knowledge where could the arts look for further advances? Any benefit would in such case be the result of casual occurrence, not of study and thought; whereas to the aid of this science they seldom look in vain. What has it not done, and does it not promise to effect for them? It has not merely improved those already in existence; it has created thousands of new sources of wealth and industry; and in the ratio of its cultivation and advance, will it still further open exhaustless stores to the millions yet unborn. To neglect the study of it, is not only to neglect the best interests of society, but to throw away the surest means of our own prosperity.

It is with much pleasure we have to acknowledge the increased attention to, and cultivation of Chemistry by those concerned in the Chemical manufacture; indeed, it is far better known by these parties (many of whom are its brightest ornaments), than by those who are employed in that department appertaining to Pharmacy, even though this is its highest object. A fact so lamentable—yet so undeniable—will, we trust, be made the subject of obligatory remedy by the expected improvements provided in Mr. Hawes's Medical Reform Bill, which we may fairly hope will be the means of raising our brethren to the first rank in this science, instead of servilely following in the rear, as at present.

It will be recollected by our readers, that our pages are not addressed merely to the speculative Chemist, but to all engaged in pursuits whose processes are founded in that science, as well as to those whose occupations lead them to the manufacture or employment of those medicines which Chemistry forms. Hence it is manifest that The Chemist is at once interesting to all; and if we may judge from its extensive circulation among Chemical Manufacturers and those engaged in the larger works of art, (from many of whom we have received most flattering testimonials of the benefit they have derived from it,) we fear not that it will find a due share of favor among Chemists and Druggists, and their pupils, in as much as it is the only Journal exclusively devoted to that science, to know which, on their part, is a duty,—to neglect which is a crime.

The pages of The Chemist will in future be rendered of greater value to the various classes of our readers, by containing a series of original papers, in each department, written expressly for the work.

I. CHEMISTRY.

MEMOIR ON ATOMIC CHEMISTRY.*

BY M. BIOT.

It being my purpose to comprehend, in the same work, the phenomenal laws of the molecular actions which many substances exercise on polarised light, and the applications which have been, and may be made of these laws, to the study of chemical phenomena, I have naturally investigated the intimate relations of these two orders of facts, and I have endeavoured to demonstrate them. For this purpose I am constrained to consider chemistry under two heads,—experimental and rational. The first head presents an immense collection of phenomena, mysteriously operated by actions at small distances, which are exerted between the invisible particles of bodies, and whose ponderal analysis always fixes with certainty one of the conditions of accomplishment; but a condition attached only to their final and complex result—not to their physical and primordial principle. It is in the reverse of these effects, measured for perceptible masses, to the molecular actions from which they are derived, that the difficulty of converting chemistry into a mechanical science consists; —a difficulty incomparably greater than in the case of planetary astronomy, where the small number of bodies perceptibly acting on each other; their almost spherical form; their dimensions so small, compared to their intervals, that they act almost as simple points; the immense predominance of one of them in every partial system; and, finally, the very simplicity of the law of action,—were so many circumstances which left this law almost unaltered, and, it may be said, apparent, in the visible and constantly observable orbit which every planet or satellite describes round the principal body of its system. On the contrary, in chemical phenomena, where the number of particles which simultaneously act on one another is immense, we are ignorant of their individual forms, their relative bulks, the proportions of their dimensions to their intervals, the laws and the nature of the forces which govern them,—finally, the modes of motion which result from them,—all these being concealed from our senses. But it is also this which gives the importance to this part of chemistry, which may be called rational rather than theoretical; which consists, first, in connecting among themselves all the results of ponderal analysis, in always expressing them by certain uniform numbers for each substance, and which I will call their *numerical equivalents*, in order that it may not be considered hypothetical; next, in expressing the association of these numbers, in every complex compound, by a literal notation, showing the ponderal proportions of its simple constituent principles; and, finally, in determining the value of these numbers, and in grouping them in the literal notation in the manner best adapted for representing the mode in which these principles are presumed to combine, as well as the analogies of this mode between the various products. Indeed, although the accomplishment of these two last conditions presents exceedingly indeterminate problems, the solutions of which must ever be empirical, nevertheless, besides its immediate utility in systematising the partial results, and arranging them into general facts, it has another, less evident and more distant, without doubt, but, perhaps, still more important, which is to be manifested among the complex results of simple relations—physical as well as numerical—of which geometricians will one day avail themselves, as indices for tracing by induction to the molecular forces from which they ought to result. These considerations have made me very careful to establish at first the experimental conditions in which chemical phenomena are seen to operate; next, to express, in the most general way, and independent of all hypothesis, the molecular relations which ponderal analysis gives the means of ascertaining, in the most simple cases, between the composing substances and the compounds produced; then to compare these results with the chemical equivalents, or atomic weights, and to see whether they have or have not the physically molecular signification generally attributed to them. It is this preliminary discussion of my work on optical properties that I wish to submit to the attention of chemists, as an attempt to apply to the highest objects of their science a new process of investigation, which seems to me particularly applicable to it.

The most general, and, at the same time, the most accurate idea we can form concerning the constitution of material bodies, according to all the experiments which render them perceptible to us, is to look upon them as compounds of particles individually imperceptible to our senses, however assisted, by reason of their minuteness, thus forming small distinct bodies, endowed, like larger ones, with universal attraction, proportional to the bulks and reciprocal to the

* Read to *The Royal Academy of Sciences, Paris*, October 19, 1840.

square of the distances, and perhaps also acting on one another by other more rapidly decreasing forces; but still kept out of contact, either by a repulsive power emanating from themselves, or by the interposition of imponderable material media, which prevent them from joining by resisting or repelling them. The individual essence and the proper qualities of these imperceptible particles, constitute the chemical nature of every body, which remains so long as they are not permanently modified, or decomposed into other molecular systems, endowed with different properties. For such mutations may be effected, or rather provoked, in many cases; not, indeed, by mechanical operations, which would be far too coarse to reach such small molecules, but by dynamic actions, arising from dissimilar particles, or by modifying the quantity or the condition of the imponderable principles, particularly electricity and caloric, attached to their material elements, or interposed between them. In order to include in one common definition all the possible diversity of their simple or complex constitution, I shall henceforth term them *the material constituting groups* of bodies, without previously determining whether the imponderable principles which always accompany them are simply interposed, or whether they necessarily form part of them. And I shall conclude characterizing them by considering them as the last degree of subdivision that any body can undergo without being chemically altered in its nature.

Material bodies, considered in masses of sensible dimensions, should, and indeed, frequently do, present to us two entirely distinct orders of phenomenal properties, some of which are essential to their substance, and specify it individually, instead of which the others are only accidental attributes. The first belong to the molecular constituent groups. They subsist and are preserved unaltered in all the states of physical disaggregation which the masses can be made to undergo, without their intimate constitution being modified. The other properties, on the contrary, which may be called contingent, accidentally belong to the whole of the groups forming the sensible mass of the body under consideration. They characterise its actual volume, its total weight, its dimensions, its form, its more or less regular and more or less resisting state of aggregation. They may be modified at pleasure, by mechanical processes, without the molecular properties experiencing any alteration. The latter alone forms the subject of chemical studies. A body of perceptible dimensions is chemically homogeneous when its molecular constituent groups are identical among themselves; it is chemically heterogeneous when they are disaimilar; and when this dissimilarity of groups exists between two chemically homogeneous bodies, it renders them chemically different. They may, therefore, be such by a difference of nature among the material elements which compose their constituent groups, by a different arrangement of the secondary groups of which the latter are composed, by an inequality either of the quantity or of the condition of the imponderable principles which may be internally associated with them, or, indeed, by various combined circumstances.

The minuteness of the molecular groups rendering them imperceptible to our eyes, even with the assistance of the most powerful microscopes, their diversity cannot be characterised, or even detected, except by the difference of the sensible effects operated by the dynamic forces which emanate from them. These effects are of two kinds: physical and chemical. The former, peculiar to certain substances, consist in the deviations which their molecular groups cause in the planes of the polarisation of the luminous rays, by virtue of an especial power which they individually exercise, and whose energy and direction of deviation are independent of the actual state of aggregation established between them. This power, which I have called rotatory, is exercised without decomposition of the active groups. The chemical effects, on the contrary, consist in reactions operated betwen molecular groups of different nature, or of different constitution, and according to which new groups are found to be formed, either by the simple association of primitive groups in a new system, into which they enter without being individually decomposed, or by a separation of their material elements, and their reorganisation in groups differently composed. My object is to show how these modifications of primitive groups may be manifested and characterised by the observation of the rotatory power, when it precedes them or results from them. For this purpose, it is necessary for me to analyse the mechanical mode by which they are accomplished, and to specify their principal laws at present known.

Conformably to this plan, I first call to mind, and define the external and perceptible conditions in which chemical phenomena are seen to operate, in order to distinguish those which are indispensable to their accomplishment, as disaggregation, independence and freedom of motion in the molecular groups, from those which only determine or excite, as the proper and mutual attraction of these groups, as well as the actions which may be exerted on them by the imponderable principles which are combined with, or interposed in them. On this subject, I develope, in detail, the possibility that chemical attraction, although perceptible only at inappreciable distances,

might derive from universal gravitation only, modified in the expression of its results by the proximity of the molecular groups, compared with their own dimensions; the same as the precession of equinoxes, and the nutation of the terrestrial axis, which are indubitably operated by this single force, decrease as the cubes and not as the square of the distances which separate the reacting bodies.

Having thus established the general conditions of chemical reactions, with all the indetermination of quantities which their peculiarities cause, I select the most simple mode of composition that the act of combination can operate. I consider only two composing substances, both chemically homogeneous. I then suppose that a combination is formed in certain proportions, into which each kind of group enters integrally, although their material elements may afterwards be separated into each group of the product formed, so that certain other arrangements may take place. And I add, for the last condition, that the product formed is itself chemically homogeneous; that is to say, it contains only one order of compound groups, identical among themselves. Finally, I examine in what cases it may be presumed that this simplicity of circumstances is realised. But I here confine myself to establishing it as a basis for argument.

In these conditions, each group can contain only a certain system of entire multiples of the constituent groups. This mode of composition immediately gives the most general expression of its absolute, individual weight, by virtue of the analogous weights of the constituent groups, multiplied by entire, positive, indeterminate co-efficients.

But the indetermination is limited by ponderal analysis, performed on appreciable bulks. Indeed the product being supposed to contain only groups of a single order, consequently of a single numerical form, the ponderal proportions of the constituent principles are, in every compound group, the same as in the total product. Deriving, therefore, these proportions from chemical analysis, I introduce them into the expression of the individual weight of the compound group. It is then found to be the product of two factors: the one, numerical and known, is exactly the atomic or proportional number of chemists; the other remains completely undetermined; chemical analysis is unable to give any notion concerning its value.

This result being established as far as regards binary compounds, I extend it to multiple compounds, but always under the same restriction,—that the product contain only a single order of compound groups. Passing thence to the case in which it contains several orders, I show that the indetermination would be still greater. For their ponderal analysis, performed on appreciable bulks, could no longer be available with the same groups, individually considered. It would give only a mean condition of ponderal proportions to be divided among them, without giving any idea whatever as to the manner in which this division is to be made.

Although these mathematical considerations might in themselves be sufficient for proving that the representative numbers of chemists are not proportional to the weight of the real molecular groups, and that they have no accessible relation to them, even hypothetically, I have been desirous of rendering this consequence still more evident by applying them to true combinations. But, for that purpose, it was necessary to select such as might fairly be presumed to contain molecular groups of a single order, and not of various orders.

This character of identity or of diversity, not being able to be accounted for, according to the single ponderal analysis of the products, always performed on appreciable quantities, we must draw our conclusions from other indications. We find, in the phenomena, if not absolutely certain, at least extremely probable, stability, or mutability, which the combinations present when submitted to external, physical, or chemical actions; as also in the more or less distinct diversity of the products which they form, and of the particular circumstances which determine them. For example, if one volume of oxygen gas, and two of hydrogen, be mixed together, in equal conditions of pressure and temperature, and if an electric spark be made to traverse this mixture, or if it be put in contact with a solid incandescent body, or if it be strongly compressed, by suddenly diminishing the space which it occupies, which may be effected by means of heat, it immediately inflames without explosion, disengaging much heat and light; after which, no free gas is found, but water, which has been formed by their combination, and whose weight equals theirs. When the mixture of the two gases is made in proportions somewhat differing from those indicated above, water is still formed, and always in the same fixed proportions. That of the two gases which is in excess, remains in the state of free gas, to the amount of its excess. But when the excess goes beyond certain limits, the combination between the quantities present of the two gases is but partially operated; so that some of each remains free. Nevertheless, the quantities combined are still in the same relative proportions as above, and the product is water, of a weight equal to their sum. Now, if this water be heated, until it is converted into steam, or if it be congealed by cooling, it undergoes neither

entire nor partial decomposition; but it may be decomposed in the first of these states, by being passed over metals which have a great affinity for oxygen, where kept at a red heat, as iron, for example. Then the weight of the oxygen absorbed, and that of the hydrogen set free, are exactly in the relation which the above expressed proportion of the volume supposes; so that the mass of vapour which has not been decomposed, has not undergone any alteration in the ponderal proportion of its constituent principles. However, and this discovery is due to M. Thenard, by making the water and oxygen depart from the combinations in which they exist, so that they are found in contact at the moment when they both become free, the combination of this water with a fresh quantity of oxygen may be determined, which repeated operations make us arrive at a weight exactly double that which it at first contained, without this term being exceeded. Thus we obtain a new, colourless, inodorous liquid, like water; but which is distinguished from it by its physical and chemical properties. For example it is denser than water, less volatile, and does not congeal at a temperature of 30° below zero. But it very readily yields its excess of oxygen to bodies which have the slightest affinity for it. It gives it up, even on the contact of metals which have no perceptible action on natural water; and, after this excess is disengaged, the remainder is found to be water in its primitive condition. The readiness of the latter to be formed at first, with the fixed proportions of the volumes of the two gases; its obstinate preservation of these proportions, under the influence of very powerful physical and chemical actions; and, finally, its disposition and uniformity, when combined with a larger proportion of oxygen; are not these, therefore, characters which indicate, with the greatest probability, a strictly defined and peculiarly stable primitive constitution of molecular groups, of a more ready formation than any other, and thus ought to exist alone, in preference, when it can be freely constituted? All simple substances, that is to say all substances which, as yet have not been decomposed, thus form with one another combinations in different proportions, distinctly defined by their numerical intervals, by their different properties, by their individual stability, by the speciality of the circumstances which determine every one of them, and by their invariable return to some one of these fixed terms, when incompletely decomposed. These are therefore what chemists call combinations of different orders. It is very probable, then, that each of these products is composed of a single kind of molecular groups identical between themselves; and it is, at all events, the least complex constitution that can be attributed to them. But other compounds also are met with, particularly organic ones, whose molecular constitution does not seem to present such complete unity, still retaining an exact uniformity of ponderal composition. Thus, many essential oils evaporated, and afterwards partially returned to the liquid state, at different periods of their distillation, separate into products, which their action on polarised light shows to be composed of different molecular groups, although their total ponderal composition is absolutely the same. On repeating the distillation of these unstable compounds, they are found continually to undergo molecular modifications; but with others, this modification does not go beyond a certain extent, as may be ascertained from the permanence of their optical properties. It might be presumed, then, that the latter contain only a single kind of molecular groups identical among themselves; instead of which, so far from that, they contain various kinds, subject to similar ponderal proportions, but formed of more or less complex multiples of a similar numerical form, as chemists have often been led to suppose; or, perhaps, identical as to numerical form, with a different internal arrangement of material elements. Nevertheless, in such cases, the supposition of the identity of the groups in the product which has become uniform, no longer relies on indications so characteristic as the combinations of different orders, with irregular intervals, separated from one another by uniform, well defined, distinct numerical proportions, as also by the speciality of the circumstances which cause each of these orders to be separately constituted.

I return, therefore, to the latter; and, as an example, I may take the various known combinations of nitrogen, sulphur and carbon with oxygen. Considering each of them as a compound of a single order of molecular groups, I introduce the results of the chemical analysis into the individual expression of their absolute weight; then I put the amount of these weights, thus obtained, in comparison with the equivalents, or atomic weights attributed to the same products; and I show by numbers, that which I formerly demonstrated by algebraic formulæ, namely: that there is no necessary proportion, nor even legitimately supposable relation, between the equivalents, as they are calculated, and the weights of the real molecular groups. As a confirmation of this, I may mention that, after what has been said above, the non-identity of the groups in each product, if it were wished to admit it by way of hypothesis, would but render these relations still more distinct.

This furnishes me with an opportunity of

introducing the literal notation generally adopted by chemists for expressing the ponderal composition of their products. I will show its utility, and the distinct applications, as well as the classification of each series of products of different orders, formed by the same substances, as the manifestation of its analogical relations with all the others. The rational use of notation, for this high object—the highest, indeed, that chemistry proposes to attain—presents one of those examples, so common in accurate sciences, of the influence which correct notations exert on the mind in suggesting ideas, and in developing abstract or phenomenal relations, whose existence is found implicitly, but not intentionally comprised in their conception. However, written signs fix incorrect ideas as firmly as they do correct ones, which renders their introduction extremely dangerous. This is the reason why, relying on the above, I would point out how many fictions and illusions, fatal to the progress of rational chemistry, may the expression "Atomic Weights" give rise to, when substituted for that of chemical equivalents first employed by Wollaston, and with so much propriety, when, indeed, these fictitious weights have no tangible physical connexion with the true weights of real molecular groups.

By characterising these groups as to simple, or hitherto undecomposable substances like corpuscules which enter internally into all combinations with the formation of which we are acquainted, I do not mean to say that they were not materially subdivisibles; for their constitution, on the contrary, may be so very complex, that we have no means of separating their constituent elements, in such a manner as to enable us to examine them separately; and this separation might even be operated in some of the combinations in which they are engaged, without subsisting after they are disunited. But in confining ourselves to the consideration of these groups in their natural individuality, that is to say, as the last term of subdivision that each substance is capable of undergoing, without being chemically altered in its nature, we are never certain of obtaining them as simplified, even when we put substances into the gaseous state. For the molecular groups which physically constitute them in this state, might indeed be very numerous multiples of their ultimate chemical groups, whose complication would vary with the temperature. Without prejudging anything as to the possible extent of the various agglomerations, we have at least, in the gaseous state, the last degree of physical attenuation that we are able to produce; and we should conclude that the mechanical laws of combinations will be manifested with greater simplicity in that state, than in any other. Now, indeed, this induction receives a very remarkable confirmation from the following fact, which was discovered and proved by M. Gay-Lussac, namely: that the æriform products resulting from the combination of several other gases, being considered in the same circumstances of pressure and temperature as their constituent principles, always contain, under a given volume, a sum of entire multiples, or of very simple submultiples, of volumes of these principles. And, as all the gases hitherto studied are equally affected by equal variations of pressure and temperature, the ponderal composition of a volume, thus expressed, gives, under the same simple form, the density of the product in the gaseous state, by the function of the density of the constituent gases. The same, when the product is not presented in that state, if it be analysed as it exists, it is always found formed of proportions of very simple volumes of the substances which compose it; and this simplicity of relations is so evident, and so general, that it ought in all probability to be considered as inherent to the mechanical conditions by which the combinations are operated in the state of gas.

This result is so important in itself, and so fecund in its consequences, that before introducing it into the ponderal expressions of complex molecular groups, I thought it useful to effect a strict numerical verification for various gaseous combinations, where it may completely experience it, in order to prove by the same numbers, whether, in the present state of our knowledge, it may be admitted as an absolute natural law, or only as an approximative one, which, in a theoretical point of view, constitutes an important distinction.

This verification is very easy, when the densities of the constituent gases are known, as well as that of their gaseous product, and the proportion of volumes according to which they combine to form it. Let us take as an example, the formation of water: according to the experiments of MM. Humboldt and Gay-Lussac, the proportion of the volumes is two of hydrogen to one of oxygen. The densities of these gases are known. Let us adopt those of MM. Dulong and Berzelius: the density of aqueous vapor is directly calculated from experiments very carefully made by M. Gay-Lussac. By combining these data by calculation, we find that one volume of oxygen gas, combined with two volumes of hydrogen gas, very approximatively constitute two volumes of steam, which is indeed a very simple relation. But, keeping to the accuracy of these numbers, these two volumes of steam would really result from 1·0056 of oxygen, combined with 2·0113 of hydrogen gas. The difference of this from the simple result, doubtless would

be unimportant in common experiments; and it is, besides, suspected of all the little errors which affect the experimental data employed in the calculation. But among these data is found the simple proportion of the volumes. Is it ascertained that it is accurate in the thousandths? And to what decimal can it answer?

Here are other examples. Chemists generally admit that oxygen gas does not change volume when sulphur is combined with it in order to form sulphurous acid gas, and with carbon to form carbonic acid gas. Let us first take the former case. M. Thenard has determined the density of sulphurous acid gas, by three experiments, which he says have varied from one another only in the thousandths. Again, M. Berzelius has very carefully made the ponderal analysis of this gas; and indeed the density of oxygen gas seems to be very well known, since that which MM. Dulong and Berzelius have ascribed to it scarcely differs from that which M. Arago and myself obtained. Combine these data; they will show that one volume of sulphurous acid gas does not contain exactly a volume of oxygen gas, but 1·01 of a volume, which would be very different for the law of simplicity of relations. Indeed, there were, without doubt, little errors in the ponderal analysis of the product, and in the measure of its density. Might not the sulphurous acid gas also, when weighed, be too near its point of liquefaction, for the general law of dilatation of permanent gas to apply to it very strictly? Or, might not the vapor of sulphur, which, according to M. Dumas' experiments is so dense, have carried into its combination with oxygen, some traces of that complication which is generally manifested in the state of liquidity? All these things are possible; as also it might be that repeated and still more accurate experiments might do away with this deficiency of 1-100dth of volume. But it would not be more improbable that, in its combination with sulphur, oxygen gas might contract to that extent. And, indeed, M. Gay-Lussac says, he has found that 100 parts in volume of this gas have always given him rather less than 100 parts of sulphurous acid gas.

The results of the combustion of carbon, published by MM. Dumas and Stass, have lead to a similar consequence*. If their numbers be employed, with the densities of oxygen and carbonic acid gas of MM. Dulong and Berzelius, it is found that one volume of the latter gas does not contain, as is generally supposed, one exact volume of oxygen gas, but 1·00556, so that there would again be a slight contraction of this gas in the combustion of the carbon. The densities found by M. Arago and myself, would reduce this number to 1·00143; that is to say, they would diminish its difference four times, leaving it in the same direction. And also, as to the composition of aqueous vapor, they would reduce the deficiency of the simple law to less than half, giving it a contrary direction. But, notwithstanding the care M. Arago and myself bestowed on our determinations, I dare not consider them more accurate, or even as accurate as those of M. Dulong and Berzelius, made so many years afterwards, with all the assistance that the perfect state of physics and chemistry could lend them, and applied by themselves.

It will not be thought, I hope, and least of all by M. Gay Lussac, that the preceding reflections tend to diminish the importance of his remark concerning the simplicity of the proportions of volumes in which gases combine with one another. I demand, on the contrary, that experiments be now made, if possible, sufficiently accurate to raise this simplicity, if it be possible, to the rank of natural and absolute laws, or to fix the limit of its accuracy, if it fall short of it. A case is here met with, similar to that of the geometricians, immediately after the discovery of attraction. It was of the last importance to know whether the simple law of the square of distances was or was not accurate; and it could be decided only by deducing from its application the most complex planetary phenomena. An imperfect calculation at first caused it to be supposed, that it gave only the half of the motion of the lunar apogee, and it was doubted whether some alteration might not be made, so as especially to apply it to this satellite. But a further approximation proved that it gave the whole motion of the entire apogee; and the same accuracy of deduction, afterwards carried into all the details of planetary motions, has raised it to the first rank of natural laws. M. Gay-Lussac will not disapprove of my also reclaiming the strict proofs which may give a similar character to the simplicity of relations which he first recognised. And if the greatness of the example which I have called to mind authorises me here to express all my ideas on this subject, I dare say, in general, that by endeavouring, as is now done, to give to ponderal analysis the utmost degree of accuracy that can be attained to, it would not always be necessary too obstinately to subject its numerical results to conditions of simplicity, which sometimes might have only a very high degree of approximation, especially in the

* According to the experiments of these two gentlemen, the ponderal proportion of the carbon to the oxygen, in carbonic acid, is 75-200dths, or 3-8ths. See *The Chemist*, vol. 1, page 329.

most complex products, without they are required to be absolutely accurate to the indications of the real phenomena may disappear, which it would be highly important to follow, in order to throw some light on the mechanism of combinations.

The preceding discussion being terminated, I return to the ponderal expressions of the real molecular groups which constitute compound products; and, considering their component principles in the gaseous state, I therein express the proportions of the weight of these principles, by relations of volume. It is seen by the very formulæ that the weights of the groups,—simple as well as complex,—cannot generally be considered as proportional to the densities of the media which they would constitute in the gaseous state; which would put them in the same number at equal volume. This equality could occur only under very peculiar numerical conditions, and experiment contradicts it in many instances, as M. Dumas, I think first remarked. The introduction of the relations of volumes besides changes nothing of the absolute weight of compound groups, since it expresses the same ponderal proportions, only under another form; and the amounts of these weights do not remain less inevitably indeterminate. But this new form, changing the literal expressions of products, in chemical notation, presents their individual composition under a more tangible physical aspect, and manifests between them very profound analogies which the abstract expression of the ponderal proportions had not indicated. This I have endeavoured to shew in the very series of combinations which I have taken as examples.

If I am not mistaken in this exposition, which I have endeavoured to read or free from all hypothesis, we ought to consider it as certain that the chemical equivalents of different substances or their atomic weights, now in use, as they are called, have no relation, I do not say only as to proportion, but no relation whatever, known or determinable, to the weights of the real molecular groups which chemically constitute bodies. I hasten to add that this conclusion has been fully confirmed by numerous experiments which I made with the intention of proving it, the general results of which I shall hereafter have occasion to mention. But then, seeing that these numbers are of such extensive utility, and of such evident service in expressing the laws of successive derivation of compounds of various orders, in every series of products, as also in manifesting the analogies of different series among themselves, we are led to enquire whether it would not be accessible to attach to them some other physical notion which might explain, or, at least, might show in what quality they intervene in the mechanism of combinations; in order that thence might be inferred the conditions of choice most proper for giving them a really phenomenal character. This specification is much more difficult to fix than to exclude that which is attributed to them. As, without assuming to myself the power of establishing it, I will merely try, in a future lecture, at least to open the way which one day may lead to it. For that purpose, I will call to mind the different physical and chemical considerations by which the values at present attributed to equivalents are determined, or which it is proposed to employ as a general principle of their selection. I will investigate the common characters which these determinations give them; and in confirming by this inverse proof, that they cannot have a molecular application, I will endeavour to show what would be, in the present state of our knowledge, the most probable mode of intervention which could be attributed to them in the mechanism of combinations.

INVESTIGATIONS CONCERNING THE CHEMICAL COMPOSITION OF THE BRAIN OF MAN.

BY M. E. FREMY.

The great extent of my researches compels me to divide my work into two parts. In the first I give the composition and nature of the different fatty matters which may be extracted from the brain, explaining the processes which I have adopted for purifying them. As this first part is fundamental, and as it is upon it that I shall rely for establishing the composition of the brain of animals, and for ascertaining the alterations that it undergoes in disease, I was desirous of submitting it to the Academy.

In my memoir, I begin by calling to mind the works on the brain which have been published, and, stopping at that of M. Couërbe, I endeavour to demonstrate the impurity of the bodies which that chemist considers as immediate products.

After this preamble, in which I acknowledge, however, that it is to M. Couërbe we owe the important discovery of cholesterine in the brain, I proceed to the explanation of the different processes which I have used for extracting the fatty matters from the brain, for purifying them and for ascertaining their proportions.

* *Academy of Sciences*, Paris: Sitting of Nov. 9. 1840; from *Comptes, Rendus, No.* 1.

From my analysis it results that the brain of man is formed of a considerable quantity of water and of matter insoluble in ether, which I designate albuminous matter. The portion soluble in either is principally formed of three matters: —

1st. Of the white matter discovered by Vauquelin, in which I have detected well defined acid properties, and which I call *cerebric acid;*

2nd. Of a liquid fatty matter, which has the composition and all the properties of the oleïne of human fat, analysed by M. Chevreul;

3rd. Of Cholesterine.

There is also found in the brain very small and variable quantities of margaric and oleïc acids, of cerebrate of soda, and of albuminous matter.

In order to arrive at this result, I have employed various analytical processes, which I described in my memoir: I may here give that which appears to me the most simple.

I cut the brain into small pieces, I boil it several times in alcohol, and I allow it to remain for a few days in that liquid.

The object of this operation is to remove the water contained in the brain, and to coagulate the albumen. The cerebral mass has then lost its elasticity, and may be submitted to pressure. The alcoholic liquors retain only traces of cerebric acid, which may be extracted by filtration.

The brain is then exhausted by means of boiling ether, the ethereal liquors are combined and evaporated. The residue of the evaporation is treated by boiling alcohol, which removes the oleïne, the cerebric acid, the cholesterine and the margaric and oleïc acids. On the liquor being cooled, the cholesterine and the cerebric acid are deposited: these two matters are separated by means of cold ether, which very readily dissolves the cholesterine, and leaves the cerebric acid. The cold alcohol retains in solution the oleïne, and the oleïc and margaric acids; this alcohol is evaporated, being rendered slightly alkaline by ammonia; at a certain period of the evaporation, oleïne is deposited, and oleate and margarate of ammonia remain in solution.

As to the portion which is insoluble in alcohol, and which is formed of albumen and cerebrate of soda, it is boiled with alcohol containing a little hydrochloric acid, which decomposes the cerebrate of soda: the cerebric acid, thus set free, very readily dissolves in the alcohol. There then remains a coloured matter, of an albuminous nature, which contains sulphur, but never phosphorus.

After having thus settled the composition of the fatty matters of the brain, I have prepared, by M. Couërbe's process, the bodies which he considers as pure substances, and I have endeavoured to show their impurity by direct experiments. Thus, I have ascertained that the body which he calls *eleëncephol*, is only a mixture of oleïne and cerebrate of soda. I first proved it by treating this body by an alcoholic solution of potassa, which saponifies the oleïne, converts it into oleïc acid, and which allows the alkaline cerebrate to precipitate. On this occasion I made an experiment, which to me appeared decisive: I procured a sample of *eleëncephol*, prepared by M. Couërbe himself, for which I am indebted to the kindness of M. Guerin; I treated it by absolute alcohol, which dissolved the oleïne, allowing a viscous matter to precipitate, which was no other than cerebrate of soda.

I have ascertained, by a similar method, that the *cephalote* of M. Couërbe is a mixture of oleïne, cerebrate of soda, and traces of albumen. I have ascertained also that his *stearoconote* is formed of a mixture of albumen and cerebrate of soda, by boiling it with alcohol acidulated by hydrochloric acid, which removes the cerebric acid, and leaves the albuminous matter.

By analysing brains in different states and at different ages, I have found that the quantity of free fatty acid contained in the brain is very variable; and that it often increased when the fatty matters were left for some time in a closed flask. I have found an explanation of this curious phenomenon: profiting by the observations made by M. Chevreul on the fat of a human body, and by the memoir which MM. Pelouze and S. Boudet published on the spontaneous saponification of palm oil.

I have seen that it was the albuminous matter of the brain that had the property of converting, by long operation, oleïne into oleïc acid.

Finally, I have discovered what part of the brain contains most fatty matter, and analysis has shown me that all the fatty bodies are found in the white matter of the brain, and that the grey matter contains only traces of it. When the fatty bodies are removed from the white matter by means of alcohol, a mass is obtained in all respects similar to the grey matter. If, therefore, it be desirable to represent the anatomy of the brain in a chemical point of view, it might be said that the part which, as it were, forms the basis of the brain is primitively grey; and that it is the fatty matter, which, diffused in the interior of the grey matters, forms those white belts, constituting the white part of the brain.

It is not my intention, however, to enter into the physiological question; but M. Magendie, who has been kind enough to furnish me with the anatomical materials necessary for my work, has promised me to take into consideration such questions as

may be interesting in a physiological point of view, when my chemical documents are complete.

NEW MODE OF ESTIMATING NITROGEN IN ORGANIC ANALYSIS.*

BY PROF. BUNSEN.

Professor Bunsen showed that the qualitative methods at present employed for the analysis of bodies containing nitrogen were defective, it being impossible to adopt these processes when the nitrogen and carbon are in small proportion to each other. His process consists in introducing the substance to be analyzed into a glass tube, after having mixed it with oxide of copper.

A few slips of metallic copper are then added, and the tube is fixed to Döbereiner's apparatus for generating hydrogen. This gas is passed through it until all the atmospheric air is expelled, giving the tube a rotatory motion at the same time, in order to dislodge any air which may be retained between the particles of the oxide of copper. The tube is then hermetically sealed, and introduced into an iron vessel filled with gypsum. The gypsum must be moist when the tube is introduced, in order that it may be firmly fixed in it. Prepared in this manner, it is introduced into the oven used for organic analysis, and surrounded with red-hot coals. If the tube be of strong green glass it will not burst.

When the combustion is finished, the tube must be placed under a graduated glass receiver standing over mercury, and the point cut off. The gas, which was under the pressure of several atmospheres, rushes into the jar. The carbonic acid is absorbed by hydrate of potassa, which is introduced into it, and the remaining gas must be nitrogen, as all the hydrogen must have been converted into water by the oxygen of the oxide of copper.

The results obtained by this method agree with theory to the second, and frequently to the third decimal place.

ON THE QUANTITY OF CARBONIC ACID THROWN OFF FROM THE LUNGS IN HEALTH AND DISEASE.

BY MR. M'GREGOR.†

Mr. M'Gregor read a paper detailing some experiments performed by him, while residing in the Royal infirmary of Glasgow, with a view to ascertain whether the quantity of carbonic acid thrown off from the lungs differed in health and disease. In health he found the mean per cent. to be 3·5 per cent., a quantity which very nearly corresponds with that of Dr. Thompson, of Glasgow, and Dr. Apjohn of Dublin; that found by the former being 3·72 as a mean ultimate result, while that of the latter was 3·6.

In the eruptive stages of small-pox, measles, and scarlet fever, the amount of carbonic acid evolved from the lungs was considerably increased; in the former to from 6 to 8 per cent., in the two latter to from 4 to 5 per cent.

During the aggress and climax of these diseases, the per centage of carbonic acid showed the above increase; while in proportion as convalescence established itself, and the skin resumed its normal appearance, the per centage of carbonic acid gradually diminished.

Ten cases of each of the above specified diseases were so examined. In chronic skin diseases an augmentation was also observed; and in one case of ichthyosis, the mean per centage amounted to 7·2 per cent. The scaliness in that case was universal, and ultimately proved fatal. In diabetes melitus, a disease in which the aliment is converted into sugar, and eliminated in the form of urea and sugar, no normal aberration could be detected, the carbon in that case being eliminated in the form of sugar and urea.

ON A NEW COMPOUND OF DEUTOCHLORIDE OF PLATINUM NITRIC OXIDE AND HYDROCHLORIC ACID.*

BY HENRY D. ROGERS AND MARTIN H. BOYE.

This substance is procured by dissolving platinum in an excess of nitromuriatic acid, and evaporating nearly to dryness; after which it is treated with aqua regia, freshly prepared, from concentrated hydrochloric and nitrid acids. A little water is afterwards added, drop by drop, just sufficient to keep the chloride of platinum dissolved, when the compound will remain in the form of a gamboge yellow powder. It is then separated by decanting and filtering, and pressed between the folds of bibulous paper, and dried *in vacuo* over sulphuric acid.

The precipitate is a yellow, minutely crystalline powder, which absorbs water with great avidity. It may be preserved, without decomposition, in dry air, or *in vacuo*. It is decomposed by water, alcohol,

* *British Association.*

† *British Association.* From *The Athenæum.*

* From *Silliman's Journal.*

&c., with extrication of nitric oxide, chloride of platinum remaining in solution. A concentrated solution of chloride of platinum has, however, no action on it. Heated in an atmosphere of hydrogen, it gives off a large amount of chloride of ammonium, leaving a residuum of metallic platinum.

ANALYSIS.

The salt analysed, was prepared and kept in the manner described. Heated to the temperature of 212° F., it does not part with any of its water of combination. For estimating the amount of platinum and chlorine, the salt was fused with carbonate of potassa, &c., and the platinum, thus obtained, weighed by itself, and the chlorine precipitated from the solution by nitrate of silver.

The quantity of nitric oxide was determined by introducing a portion of the salt into a graduated tube, inverted into mercury, and decomposing it by letting up the requisite proportion of water.

The mean of a series of experiments, varied in different ways, gave

Platinum.....	41·26	per cent.
Chlorine	43·89	,,
Nitric oxide ..	4·98	,,

The above results correspond to five atoms of bichloride of platinum; five atoms hydrochloric acid, and two atoms of nitric oxide. The water was calculated, from the loss in the analysis, to be equivalent to ten atoms.

Respecting the chemical nature of this compound, it may be regarded, either as a chloride of platinum, with a muriate of nitric oxide, represented by the following formula, $(Pt\,Cl^2)^5 + [(Cl\,H)^5 + (NO^2)^2] + 10$ Aq. or as a double chloro-salt, a chloro-platinate of nitrogen, with a chloro-platinate of hydrogen, represented by the formula, $[(Pt\,Cl^2)^5 + N\,Cl^2]^2 + (Pt\,Cl^2 + H\,Cl) + 14$ Aq.

ON THE PREPARATION OF ALLOXAN, ALLOXANTINE, THIONURATE OF AMMONIA, URAMILE, AND MUREXIDE.*

BY PROF. GREGORY.

To prepare alloxan from uric acid, Liebig and Wöhler used nitric acid sp. g. 1·42, and separated the acid liquid from the crystals by means of a porous brick, thus losing the whole mother liquid. The author uses nitric acid of sp. g. 1·35. The action of this acid on uric acid must be kept moderate. When crystals of alloxan are formed, the whole is thrown on a filter, the throat of which is stopped with asbestus. That portion of the acid liquid which remains in the crystals is displaced by a few drops of cold water, and the crystals are purified by recrystallization. The liquid is again employed in the same way, and the crystals collected as before.

Five such operations may be performed with the same liquid, each yielding a large crop of crystals; while the mother liquid is preserved, and yields a large quantity of parabanic acid, or oxalurate of ammonia. By this process the author obtains from 100 parts of uric acid, 65 of anhydrous alloxan, or 90 of alloxan + 6 aq. From alloxan, alloxantine is easily obtained by the action of sulphuretted hydrogen.

Thionurate of ammonia is easily formed, by boiling a solution of alloxan with sulphite of ammonia and free ammonia. Uramile is also easily obtained, by boiling a solution of thionurate of ammonia, with an excess of diluted sulphuric acid. Murexide is obtained, as described by Prof. Gregory elsewhere.

He now exhibited the last three processes. He also stated, that the theory of the formation of murexide was of great importance in reference to organic colouring matters.

ON THE ESSENTIAL OILS OF BLACK MUSTARD AND COCHLEARIA.*

BY J. E. SIMON.

Mr. Simon admits, that when the sulphur is removed by means of dry or hydrated oxide of lead, or by means of the binoxide of mercury, from the crystalline combinations of the essential oil of black mustard and ammonia, two basic bodies are produced—one solid, the other unctuous. MM. Robiquet and Bussy mention only one in their work. The unctuous base is soluble in water, alcohol and ether, whilst the solid base is soluble only in water; it is but little soluble in alcohol, and not at all so in ether. The latter agent, therefore, presents the best means of separating them.

It is also a peculiarity of the combination of essential oil of mustard and ammonia to give by distillation with sulphuric acid, an acid which acts on oxide of iron like sulphohydrocyanic acid.

The substance which is obtained when the sulphur is extracted from the oil itself is also very remarkable. It is a crystallizable

* *British Association*, Sept. 1840; From *The Athenæum*.

* *Annalen der Physik und Chemie*, vol. L. p. 377.

body, readily soluble in alcohol and in ether. Mr. Simon calls it *sinapoline*, from *sinapis* and *oleum*. It may be distilled with water, without decomposition; it melts at 90° C. and afterwards sublimes, and is decomposed at 170—180° C. It dissolves at the ordinary temperature in sulphuric and nitric acids; but at a higher temperature, the former acid turns it brown, whilst the latter converts it into a new acid.

The essential oil of cochlearia has to that of mustard a resemblance analogous to that which essential oil of laurel, has to oil of bitter almonds.

Essential oil of cochlearia forms with ammonia a crystallizable compound, whose crystals, according to M. Mitscherlich's examination, greatly resemble those of the ammoniacal compound of essential oil of mustard.

If, by means of any of the indicated agents, the sulphur be removed from these crystals, two bases are formed—the one unctuous, and the other solid—separable from one another by the abovementioned means.

This oil also furnishes by its desulphuration a crystallizable body, soluble in ether, in alcohol, and in water, and in all respects resembling sinapoline.

But the boiling point of these oils is different.

Mustard oil boils at....148° C.

Cochlearia oil at .....156—159° C.

Cochlearia loses, as we know, all its smell by desiccation, and, consequently, it is regarded as inert, when in the dry state. This alteration has hitherto been attributed to the volatile nature of the essential oil; but it is not so. Probably the albumen of this plant acts the part of the myrosine in the mustard seed, and perhaps it is this that is altered by desiccation. If dry cochlearia be distilled with water, an inert and insipid product is obtained; but if there be added to the water myrosine procured from white mustard, an oil, like that of fresh cochlearia is obtained.

M. Simon makes mention of an acid capable of being distilled, and which may be obtained by water rendered alkaline by carbonate of soda. In this case there is in combination with the soda an acid, which acts on a solution of silver, like formic acid, but which is distinguished from it by the greater solubility of the salt which it forms with lead, as well as by its different crystallization. The author proposes for this, the name of *sinapinic acid*.

ON BIMALATE OF AMMONIA.

BY L. A. BUCHNER, JUN.

By adding a solution of malic acid to a solution of neutral malate of ammonia, after proper concentration, large crystals of bimalate of ammonia are obtained.

M. Liebig, relying on the facility with which this salt crystallizes, has proposed the following method for the preparation of pure malic acid. Crude malate of lead, obtained by precipitation, from the juice of the berries of the sorb tree with tribasic acetate of lead, is decomposed by means of dilute sulphuric acid; the liquid acid is filtered, and half of it is perfectly saturated with pure or carbonated ammonia; the other half is then added, and the liquor is then evaporated to crystallization. The crystals obtained are purified by a second crystallization, and decomposed by acetate of lead. The pure malate of lead is afterwards decomposed by sulphuric acid, or by sulphuretted hydrogen, &c.

In this manner I have prepared pure malic acid with a large quantity of sorb berries, and I can affirm, that I know not a simpler or better method. Indeed, the bitartrate and the binoxalate of ammonia are difficultly soluble in cold water, and crystallize only in small prisms; the bicitrate of ammonia does not crystallize at all, but forms, according to my experiments, only a syrupy hygroscopic mass; so that these salts may easily be separated from bimalate of ammonia, if their acids exist in the sorb berries. The beauty of the crystals of bimalate of ammonia which I obtained by this operation, determined me to request professor Kobell to submit them to a crystallographic examination. The result obtained by that learned crystallographer is as follows:—

The crystals belong to the rhombic system. The most ordinary combination, according to the formulæ of Mohr and Naumann is

$$\infty P, \infty P\infty, P\infty, \tfrac{1}{2}P\infty.$$

The angles are,

$$\infty P = 110°.$$
$$P\infty = 107°.$$
$$\tfrac{1}{2}P\infty = 139° 24'.$$

The crystals appear by predominant extension of the faces $\infty P\infty$, as sharpened rectangular tables. They are perfectly cleavable according to ∞P, imperfectly cleavable according to $\infty P\infty$, not cleavable according to $\infty P\infty$.

I made an analysis of bi-malate of ammonia in the following manner:—

1st. A certain quantity of the salt, for some time exposed to a current of dry air at 100°, lost nothing in weight. At a higher temperature, it disengaged ammonia.

2nd. 0·471 grammes gave by combustion with oxide of copper, 0·558 of carbonic acid

and 0·250 of water. Hence the salt would contain per cent—

Carbon.....	32·69
Hydrogen	6·07
Oxygen and nitrogen	61·24

3rd. 0·61 grammes, dissolved in a little dilute hydro-chloric acid, and precipitated with an alcoholic solution of chlorine of platinum, gave a precipitate, which, washed with alcohol and calcined, left 0·395 of metallic platinum. That corresponds to 0·0688 of ammonia = to 11·27 per cent.

According to this analysis, bimalate of ammonia is composed of

1 equiv.	Ammonia..	= 214·47
2 ,,	Water	= 224·96
2 ,,	Malic acid..	=1461·42

$$N, H\,6 + 2\,\overline{Ml} + 2H_2O = 1900{\cdot}85$$

It contains per cent.

Ammonia	11·28	containing	1·97 H
Water ..	11·84	,,	1·31 ,,
Malic acid	76·88	,,	2·63 ,, &32·17C
	100	,,	5·98 H &32 17C

The rational formula for this salt should be: $(N2\,H\,8\,O + \overline{Ml}) + (H\,2\,O + \overline{Ml})$, that is to say, a combination of neutral malate of ammonia with hydrated malic acid.

Bimalate of ammonia possesses an acid and agreeable saline taste; it is very soluble in water, and insoluble in alcohol and in ether.

ON THE IDENTITY OF SPIROILOUS AND SALICULOUS ACIDS.*

BY DR. ETTLING.

The oil discovered by M. Pagenstecher, and obtained by distilling the *spiræa ulmaria*, has already attracted much attention. Dr. Ettling had analyzed it before the appearance of M. Piria's valuable paper on Salicyl.

This oil decomposes by keeping into two oils, one of which is specifically lighter, the other heavier than water. Dr. Ettling discovered that the latter possessed the same composition as hydrated benzoic acid.

The action of ammonia on the oil gives rise to some new interesting compounds. To obtain these compounds, it matters not whether saliculous or spiroilous acid be employed. The final product of the action of ammonia upon these, is the amide of salicyl (salicylamide). This body clearly belongs to the class of amides, for it does not evolve ammonia, on the addition either of potass or of acids. The cause of its formation is as follows: three atoms of saliculous acid combine with three atoms of ammonia, and form saliculite of ammonia, whilst three of hydrogen and oxygen unite together and form water. This salicylamide combines with copper, iron, and lead, forming compounds.

* *Journal de Pharmacie*, Nov. 1840.

† *British Association*, Sept. 1840.

TURNER'S CHEMISTRY.

Elements of Chemistry, including the Actual State and Prevalent Doctrines of the Science. By the late EDWARD TURNER, M.D., F.R.S. L. and E. Seventh Edition. *Edited by* JUSTUS LIEBIG, M.D. Ph.D., F.R.S. L. and E., *Professor of Chemistry in the University of Giessen; and* WILLIAM GREGORY, M.D., F.R.S.E., *Professor of Chemistry, King's College, Aberdeen.* London: Taylor and Walton.

DR. TURNER'S Elements of Chemistry have long been known to our readers, who have, like ourselves, been frequently indebted to them for much valuable information. The work has passed through several editions, and has been favoured by a discerning public with a most extensive patronage, —a patronage to which its high merits most assuredly entitled it.

It is with much pleasure that we enter on the task of giving some brief notice of the seventh edition of this valuable work, on the appearance of which we may congratulate not only the student, but the more experienced Chemist, as affording a treatise to both, whose perspicuity, arrangement of subjects, clearness in the detail of experiments and elegance of style, entitle it to the highest rank as an elementary work on Chemistry.

The late sincerely lamented and amiable DR. TURNER intended to have perfected his work, with the valuable co-operation of Professor LIEBIG, who undertook the department of Organic Chemistry; but death, which deprived science of one of her brightest ornaments, prevented the carrying out of his intention. The task thus fell to the lot of DR. GREGORY, and we are glad that the preparation of the present edition for the press has been confided to such able hands. Greatly should we have regretted, if, from want of revision, and adaptation to the more recent advances of chemical science, since the lamented death of the author, this work —the monument of one of the most amiable, laborious and kind-hearted men that ever filled the Professor's chair—had been suffered to sink into oblivion. From our personal knowledge of the talents and worth of

the late Dr. Turner, we are able to attest the good fortune of University College in having selected such a Professor to fill the Chair of Chemistry on the opening of that distinguished seat of learning, nor have we less reason to congratulate them on the appointment of his worthy and talented successor, Mr. Graham.

The department of Inorganic Chemistry has been enriched by some important "recently ascertained facts." Dr. Gregory says in his Preface that "he felt that he could not hope to add any thing to the beauty and perspicuity of Dr. Turner's exposition of the doctrines of Chemistry, and particularly of combination in definite proportions, and of the atomic theory." Among the most interesting additions to this branch of chemistry, we may mention a chapter entitled, "*General Remarks on Salts*," which afforded us much gratification in the perusal.

But it is in the department of Organic Chemistry that this work more particularly excels. All the experiments necessary for giving the great weight to this interesting branch of chemical science were made by the celebrated Professor Liebig.

The development which Organic Chemistry has recently taken — the many discoveries in, and additions to it which have been made during the last few years, — for some time have called for a work of this nature, into which they might be collected and embodied, and this deficiency, so long and so severely felt by men of science in this country, is thus amply supplied.

To enter into anything like a detail of the numerous excellencies with which this portion of the work abounds, would be impossible; we will therefore leave it to our readers to judge for themselves.

It is impossible to single out any subject which is not treated in the clearest and most satisfactory manner—a quality, which, although indispensable in a work of this kind, is not always met with. In every chapter or subject we find recorded all the discoveries made since the last edition, yet, with such care, and neatness of detail, that the volume, although abounding with every necessary information, is retained of a size that gives it an advantage over most others.

To the student in chemistry it is decidedly the best adapted of any manual in the English language. It is, indeed, a condensed epitome of the science. This is one of the greatest recommendations to those who wish to possess a work giving, in detail and consecutive connexion, the facts and doctrines of the science. Such is the work before us.

We earnestly hope that chemists and druggists will pay greater attention to chemical science. Their apprentices, also, should be allowed time for study, and should be made to do so; as, in case of a medical reform bill being passed, enacting that they shall undergo an examination, they will not be qualified to practise as chemists and druggists, even though they have duly served their apprenticeship, unless they are thoroughly conversant with chemistry, as well as other sciences, which they will be compelled to study. To these, the volume before us will indeed be an inestimable treasure.

For ourselves, we have often derived great advantage from the perusal of this work, and we are, therefore, enabled amply to attest its value to all lovers of chemical science.

ON THE EXTRICATION OF BARIUM, STRONTIUM AND CALCIUM.*

BY DR. HARE.

In this paper, Dr. Hare first calls attention to the following phenomenon observed by him almost twelve years since, and published. When the circuit in a galvanic battery, the deflagrator of the author, was completed through a saturated solution of chloride of calcium, the anode being formed by a coarse, and the cathode by a fine platinum wire, the latter was rapidly fused, while, when the situation of the wires was reversed, the ignition was comparatively feeble. It having occurred, some months since, to Dr. Hare, that this phenomenon might be due to the evolution and combustion of calcium at the cathode, he proceeded to apply a galvanic deflagrator of three hundred and fifty pairs of plates, in the process of Berzelius and Pontin, for preparing the amalgams of the metallic radicals of the earths. The author gives a sketch of the present state of our knowledge in relation to the metallic bases of the alkaline earths, as derived from the experiments of Davy; adding his own observations, in confirmation of the declaration of Davy, that the substances obtained by him from baryta and strontia, were amalgams of their metallic bases, and not the bases themselves; and, further, that the process employed for obtaining calcium, by Davy, was really incompetent to effect the desired result. He then proceeds to describe the peculiar apparatus by which amalgams of barium, strontium, and calcium were procured; the chlorides of the respective alkaline radicals being exposed to galvanic action, the cathode being mercury, and the anode a coil of platinum wire. The details of the apparatus cannot be properly understood without the figure which accompanied Dr. Hare's communication: its

* From *Silliman's Journal.*

chief peculiarities are the following: —

1st. It furnishes the means of keeping the mercury, forming the cathode, at a temperature nearly as low as 32° Fah.

2nd. It prevents exposure of the amalgam of the radical, to the direct action of the chlorine from the chloride used.

3rd. The alternate and successive, or the simultaneous action of two galvanic deflagrators, was conveniently obtained.

Dr. Hare states that after operating with a series of two hundred pairs of plates, of one hundred square inches each, for twenty minutes, unaided by these improvements, he had found the proportion of calcium to be but one six-hundredth part of amalgamated mass.

An apparatus for distilling the amalgam is also described and figured in Dr. Hare's memoir. It consists of an iron alembic, connected with a glass receiver, and an adopter communicating with a reservoir of hydrogen, and containing chloride of calcium and quick-lime. Within the alembic, an iron crucible, containing the amalgam, was placed, the crucible being closed by a capsule, in which was a portion of cautchoucine, and by its cover. Naphtha was poured into the alembic. The air from the apparatus was expelled by hydrogen, desiccated by passing through the chloride of calcium and quick-lime in the adopter. The distillation was conducted by applying heat principally to the upper part of the amalgam to prevent an explosive ebullition. The mercury being distilled off, which requires a bright red heat in expelling the last portions, the metallic radical remained in the crucible.

The metals oxidize rapidly in water; are brittle, fixed, and require a good red heat for fusion. They sink into sulphuric acid. By keeping in naphtha, they acquire a coating which renders them less active when exposed to water.

Dr. Hare attempted to separate from the amalgams when solidified by the use of solid carbonic acid, by straining them through leather; but the result did not answer his expectations.

By using solid carbonic acid and hydric (sulphuric) ether, Dr. Hare solidified a mass of the amalgam of ammonium. He considers that in this case a portion of ether combines with the alloy, without impairing its metallic character.

ON A NEW FAT ACID.

BY DR. PLAYFAIR.

Dr. Playfair had examined some of the vegetable fats, for the purpose of ascertaining whether the margaric acid contained in them possessed a constant composition. He remarked that the acid in the butter of nutmegs was peculiar, and had not formerly been examined. Pelouze and Bondet have stated in the *Annales de Chimie*, that it is margaric acid.

Dr. Playfair considered that the radicals of serecic and œnanthic acid were similar; in the former, however, one equivalent of hydrogen is replaced by one equivalent of oxygen. It is a beautiful white crystalline compound melting at 49 C. and is soluble both in alcohol and ether. The combination of the acid with oxide of glyceril, exists in the butter; it unites with metallic oxides and forms salts: these were described, but the results are not susceptible of analysis, as they were principally numerical.

The formula of the acid is $C_{28}H_{54}O_3$.

PROCESS FOR PREPARING HYDROBROMIC AND HYDRIODIC ACIDS.*

BY DR. R. W. GLOVER, OF NEWCASTLE.

Dr. Glover having observed that the solid bromide and iodide of barium are decomposed by sulphuric acid, with the evolution of hydrobromic and hydriodic acids, without bromine or iodine being set free, proposed the employment of these salts of barium as very convenient sources of the above-named hydracids in atomic proportions.

ON A PECULIAR CLASS OF VOLTAIC PHENOMENA.*

BY MR. STURGEON.

The author directed attention to some experiments published by himself in 1830, and to his theory respecting the electro-chemical action of the simplest metals on acid and other solutions. He stated that the fact of iron not precipitating copper from its sulphate and other solutions, as recently observed by Prof. Schönbein, was one of the many beautiful phenomena discovered by Keir, and published in the Phil. Trans. for 1790.

ON THE RESIN OF SARCOCOLLA.

BY PROFESSOR JOHNSTON.

The resin of sarcocolla of commerce, may be separated by water into three portions: —I. A gum (A) which does not dissolve in

* *British Association*, Sept. 1840.
† *Ibid.*

water or alcohol, but which is chiefly washed out by means of the former solvent.

II. A portion (B) insoluble in water, but soluble in alcohol, which is of a resinous aspect, and is represented by $C_{40}H_{22}O_{14}$. The hydrate is $C_{40}H_{22}O_{14}+3HO$ when dried at 60°. This portion B, is separated (decomposed?) by bases into two or more organic compounds. The alcoholic solution gives with neutral acetate of lead a salt containing an organic constituent represented by $C_{40}H_{25}O_{16}$.

Ammonia throws down from the mixed solutions a second salt of lead, the constitution of the organic constituent in which has not yet been determined.

III. The portion soluble in water from the crude sarcocolla, when evaporated to dryness, may be separated by alcohol or ether into a soluble (C) and an insoluble portion (D).

IV. The soluble portion C dried at 212, gave results approaching to $C_{40}H_{22}O_{15}$, but when treated with bases, gave salts containing organic constituents of a different constitution. A neutral acetate of lead throws down a salt represented by $P6O+C_{40}H_{28}O_{15}$, and the subsequent addition of the neutral *tris*-acetate a salt represented by $2P6O+C_{40}H_{22}O_{16}$.

V. The portion D, soluble in water, but insoluble in alcohol, consists of a gum and of a substance which is precipitated by neutral acetate of lead in curdy flocks. The investigation is still in progress, and the results are to be considered as open to correction.

ON RESINS.*

BY PROFESSOR JOHNSTON.

Prof. J. in this paper, drew attention to following facts, apparently established by a table of analytical results, which he exhibited, and has had printed:—1. That the resins differ from each other in containing various proportions of oxygen. 2. That those in which the quantity of oxygen is the same, the hydrogen may vary, and this is another cause of difference in the properties of the resins. 3. That in all resins hitherto carefully analyzed, the number of atoms of carbon is constant. 4. That the resins, as a natural family, may be represented by a general formula containing two variables. 5. That the known resins divide themselves into two groups, possessing unlike chemical and physical properties. That of one of these groups, colophony may be considered as the type, and that it is represented by $C_{40}H_{32}+xOg$; that gamboge, or dragon's blood, may be considered as the type of the other group, which is represented by $C_{40}H_{24}+xOy$.

* *British Association*, Sept. 1840.

II. CHEMICAL MANUFACTURES.

PHOTOGENIC DYEING.

BY M. LAPOURAILLE.

A dyer, at Lyons, has for some years past been endeavouring to bring to perfection a mode of dyeing silks and cottons by solutions of metals alone, without the addition of any colouring matter. He found the solution of gold to be the best adapted for this purpose, and though he by this means contrived to produce a beautiful lilac and violet tints on the silks, they were not durable, and the expenses of such a mordant as a solution of gold induced him to discontinue his experiments. The plan he pursued was that of producing or deepening the tints to be obtained by exposure to the light, therefore it may be properly called a photogenic process. Though M. Lapouraille did not succeed to such an extent as he desired, he still conceives the plan capable of being carried into effect with great advantage; and for the purpose of directing attention to the process, and of assisting others who may wish to pursue the experiments, he has given the following account of those he instituted, with the results:—

In one third part of hydrochloric acid and two of nitric acid I dissolve fine gold. I pour some distilled water into a vessel. I add to it a few drops of the solution of gold, and then put in my silks. Whether the silk be dressed or undressed, the effect is always produced: but the colour is more beautiful in white silk that has been dressed. After the silk has remained ten minutes in the diluted solution of gold, I squeeze it, and put it to dry without washing. The colour that the silk has taken is a bright straw colour; no change is perceptible on the first day; and, in the shade, not any on the second; but when exposed to the sun the silk assumes various colours, alternating from red to yellow and lilac; and by this variation of colour forming changes of tints that disappear when removed from the sun. Unfortunately these tints are neither beautiful nor permanent beyond ten or twelve days at most. After this time the grey lilac, almost white, colour that the silk as-

sumes in the shade has only a slightly redder tinge when exposed to the sun, but the varying tints are lost. In order to obtain lilac as well as violet colour, the acid must be extracted from the silks that have gone through the solution of gold. They are then exposed to the sun, and in a shorter or longer time according to the power of the sun a very fine lilac is obtained; in summer one hour is long enough, but in winter it requires eight days, fifteen days, and sometimes even a month. In a camera obscura I have obtained very pretty tinges of lilac in ten minutes. To procure tints as deep as violet, it is requisite to put the silk already tinged with lilac again into the diluted solution of gold; the colour is not destroyed, it is rendered more bright. It is dried without being washed, the acid is afterwards extracted, and it is exposed to the sun; in a few hours the tint becomes twice as strong, and by repeating this process five or six times a beautiful violet colour is obtained.

On paper and on cotton lilacs are obtained in the same manner, but the colour is not so deep as it is upon silk. I have kept silks for three years dipped in a solution of gold. They had only a slight tinge of grey lilac, almost white, but after extracting the mordant and drying the silks in the sun, I have produced a very fine lilac twenty times deeper than it was before. All the lilac or violet colours which are obtained by the solution of gold, become red when exposed to the sun, to artificial light, or to a solution of alkalies; in the shade, or in contact with acids, they become blue; in the air they are unchangeable.—*Inventors' Advocate.*

IV. PHARMACY, &c.

THE STATE OF MERCURY IN THE UNGUENTUM AND PILULA HYDRARGYRI.

BY CHARLES WATT.

The state in which the mercury exists in "Unguentum and Pilula Hydrargyri" has long been a subject of perplexing speculation, both to physicians and to chemists; to the former, it has been a source of much dispute and discussion, whether the metal is in a state of minute division or protoxidation caused by the continued friction necessary for the formation of these compounds. To the latter, the process of preparing them has been equally a subject of difficulty, in as much as it is always very tedious and uncertain, seldom being finished under many hours, and more commonly as many days, completely tiring out those to whose lot the act of rubbing it unfortunately devolves; the trouble of which often induces the parties so engaged either to use surreptitious means of effecting the purpose, or to cast away a great portion of the mercury, and thus greatly to deteriorate the results.

Under the impression that the mercury in these preparations is in a state of protoxide, it has been suggested to form them by subjecting calomel to the action of ammonia; and, after repeatedly washing the precipitated protoxide, to mix it with the fats or conserve, according as one or other of these preparations is to be formed; but it is universally admitted, that when thus made, they are not found to equal in their operations those produced in the ordinary way; viz. by long trituration with fat or conserve,

It seems somewhat unaccountable, that chemists should not have made some analysis of these substances; at any rate none is to be met with in books. We find even such men as Dr. Duncan using very unscientific language respecting them. He considers that the facility afforded by the use of some old mercurial ointment in the process is, because the latter acts like a ferment. This, as will appear in the sequel, is absolute nonsense. Mr. Richard Phillips, in his translation of the Pharmacopœia, reprobates the use of oleum sulphuretum and turpentine, but gives no reason for his objections, nor suggests any substitute; he therefore adds but little to our stock of knowledge on the subject.

The numerous communications concerning, and processes for the "Killing of Mercury," as it is termed, we have of late received from all parts of the kingdom, have induced us to make many experiments, in order to set at rest the question as to "the minute division," or "protoxidation of mercury," in the preparations under consideration, and we are happy to be able to inform the readers of *The Chemist*, with perfect success. The results at which we have arrived will involve many considerations of great importance in medicine, utterly at variance with the commonly received opinions of the actions of the preparations of mercury upon animal bodies, in as much as they show, that finely divided mercury either rubbed on the surface or administered internally, will produce the same constitutional effects as the oxides, chlorides, or salts of that metal. It has always been held that, to produce its peculiar action on the body, it must be in the state of oxidation, or of combination with chlorine, which we shall subsequently shew to be erroneous.

Hitherto the most prevailing opinion of practitioners and chemists is, that the mercury is oxidated by the long friction it undergoes, in contact with the fat or conserve in the preparation of the ointment and blue pill: they will therefore be strangely surprised at being told, that in neither of these preparations is the mercury in the state of oxide, but that, on the contrary, it is in a state of extreme comminution, as will be made manifest by the following experiments, which were made with the greatest care, and with frequent repetition.

Having procured samples of mercurial ointment from parties distinguished alike for scientific knowledge, and undoubted probity, we divided each of them into four equal parts, and put each part into a glass vessel, which we subjected to the following operations.

Into one we introduced plain water, and placed the vessel over a lamp until it boiled for half an hour, when it was removed; the fat very soon floated entirely on the surface, and the mercury subsided to the bottom On pouring off the fat, while liquid, and also the water, and then adding fresh water to the precipitate and boiling it for a short time to free it from any adhering grease, the whole of the particles of mercury became collected into one brilliant mass.

The sample in the second vessel we subjected to the action of a sufficient quantity of weak alkaline ley to combine with the fat; after boiling for half an hour, we allowed the mercury entirely to subside, and then poured off the supernatant saponified liquid, added fresh water, and boiled it for a short time.

In this, as in the preceding case, the precipitate became united into a mass of metallic mercury.

In the third vessel, after melting the fat, we poured in two drachms of muriatic acid, with the intention of noting if any chloride of mercury would be formed, and therefore raised the heat and kept the contents of the vessel boiling for half an hour, and then removed the heat, and allowed the mercury to subside. When the fat and acid were quite clear, we poured them off into a phial and tested the liquid and the precipitate with lime water, caustic ammonia, and water impregnated with sulphuretted hydrogen, but without the slightest evidence that they contained mercury in combination with either oxygen or chlorine.

On adding fresh water to the precipitate, and boiling for some time, the particles of mercury, as before, became perfectly united.

Into the fourth vessel, after melting the fat and allowing the precipitate to settle as in the previous experiments, we removed the liquid fat and added about two drachms of nitric acid somewhat diluted to ascertain whether any binoxide of nitrogen would be liberated, as the formation of this gas would clearly indicate, that the mercury was in the metallic state, while its absence would of course show that the acid had acted on an oxide. So soon as the acid was poured upon the precipitate, the gas escaped in copious red fumes; hence the mercury must have been quite free from oxygen.

We have now shown, past all doubt, that mercurial ointment is a mere mechanical mixture of that metal and fatty matter—and not a chemical combination between them; and we may remark that our experiments are the more satisfactory, from the coincidence, that the weight of metallic mercury obtained by them, exactly corresponded with that prescribed in the formula of the London Pharmacopœia.

We may here state another result of our labours worthy of observation, i.e., the fatty matter was entirely changed into oleïc and steäric acids, modifications of oily bodies discovered by Chevreul.* It has been before remarked, that, when the ointment was merely melted over water, the mercury subsided, while the oily matter rose to the surface, this alone proves that the mercury could not be an oxide, for if it were, it would be in combination with the oleïc and stearic acids, a fact with which chemists are well acquainted.†

We have kept the mercury obtained during these experiments, and have noted the places whence they were procured, in order to be able to satisfy any doubts; which, however, may be perfectly dispelled by the repetition of the methods we have detailed.

With regard to the state of mercury in the blue pill, we may here remark, that it is precisely the same as in the ointment, viz. in that of minute division, and can be obtained by merely adding water, and boiling it till the mercury is collected into a mass at the bottom of the vessel.‡

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* See Chevreul's papers in the *Annales de Chimie et de Physique.*

† This circumstance is exceedingly peculiar, because, in order to form them in the ordinary way, long boiling in water with alkalies, earths or metallic oxides, is required, whereas here, on the contrary, they are found to be produced by trituration alone without the aid of any oxide, or even the contact of water.

‡ We may observe that the late distinguished surgeon, Mr. Abernethy, with his usual accuracy of observation, noted the difference of blue pill made at various places, and cautioned his pupils against using any not prepared with fidelity, and the best conserve, as when badly compounded, it proves irritating to the prima viæ; the

We cannot conclude without observing that where either the ointment or the blue pill is employed, it is evident that the same constitutional effects result, though the mercury is in the metallic state, as take place from the administration of any of the chemical combinations of that substance, and that therefore they do not depend on the presence of oxygen.

Our space will not at present allow of further details on this subject: we shall however resume it on some future occasion.

REMARKS ON THE HOMŒOPATHIC DOCTRINE OF HAHNEMANN.

BY MR. YOUNG.

When an allopathic* physician prescribes for his patient, he generally gives at least three or four compound medicines: so that, in an ordinary prescription, it is no uncommon thing to see a patient taking eight, ten, or twelve medicines, differing from each other in their effects on the human body; and these prescriptions are written with the idea that each medicine will perform its allotted part; for instance four medicines, which may happen to be called severally, diuretic, aperient, sudorific and expectorant, may, by chance, be combined in one prescription. Now, will any man in his senses be prepared to say that four such medicines, compounded and given to a person (either healthy or diseased), will produce each its attributed effect. Will such a medicine produce an increased secretion of urine, an increased secretion from the bowels, unusual perspiration and expectoration at one and the same time? I am inclined to think not; for even were it possible, the aperient would prevent the due action of the other three, by hurrying them through the alimentary canal.

To expect that those medicines, which when administered singly, produce certain deviations from the normal state, will, when combined with others of a different nature, produce each its separate effect, is the height of absurdity. Camphor and opium are often combined; and yet physicians are agreed as to their antidotal qualities. It is curious that it never entered their sagacious noddles that every medicine might have its antidote. That such is the case has been amply proved by Homœopathists: what therefore can be expected, but uncertain and unsatisfactory results from such random prescribing.

But this is not all. Certain medicines have peculiar effects attributed to them, but there is no existing proof that these medicaments do act in the manner described; a medicine tastes bitter, and it is set down as a tonic, yet how any medicine can give tone to the system I cannot conceive since no medicine possesses mere curative properties, but acts on the organism, by producing symptoms analogous to the disease they cure. "Certain general therapeutic qualities are attributed to particular substances. One is still, as it was said to be in the time of Dioscorides, 1700 years ago, a diuretic, another a sudorific; a third as an anodyne, a fourth an antispasmodic, and such, still is the description of them given in the pharmacological works of the present day. Hahnemann asserts, however, that in many instances they fail of producing the effects attributed to them."

But I am digressing in rather an unpardonable degree. The founder of Homœopathy, in the course of his experiments found that, to administer medicines with certainty and success, it was necessary they should be as pure as possible, and that they should be given singly and separately; that no food which acts medicinally should be allowed during their administration, and that the dose should not be repeated until the energy of the previous one was exhausted.* By this means the efficacy of a medicine was fairly tested; for in a mixture of ten or twelve medicines, how could the physician declare which was the one that removed the complaint?

It is a fact—and one worthy of notice—that medical practitioners in four-fifths of the diseases they treat, give purgative medicines. Morrison was only one-fifth worse, as he gave purgatives in every case. They called him a quack, and no doubt he was one; still he was only following the example set him by the most eminent of the faculty.

An Homœopathic physician never purges, bleeds, or blisters a patient, and yet cures disease in a prompt and safe manner: this advantageous method of cure is rendered

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reasons are now clearly manifested by our experiments, which demonstrate that the mercury, by being triturated with conserve which is acidified, becomes oxidated, and then acts too powerfully on the organs to be used as an alterative, and still less to be taken in large doses in cases of Syphylis.

* Allopathic—from *αλλον, different*, and *παθος, affection*; applied to substances which excite an affection different from that against which they are employed.

* How different this from the practice of the old school, who, when a medicine fails to effect a cure, increase the dose and lessen the period between them, as though they considered that if one drachm would not cure, twenty would.

available by observing the three following rules:—

1st. By giving every medicine singly and individually, taking care that nothing medicinal is taken to interfere with the due action of the medicament.

2nd. By choosing a medicine which causes the same symptoms, or symptoms most resembling those of which the patient complains.

3rd. By giving the medicine so chosen in doses sufficiently small, that no re-action shall ensue,* and by so preparing the medicine that its full virtues shall be apparent. Of the disadvantages likely to follow the indiscriminate mixing of medicines, I have already treated; I have likewise pointed out the advantages gained by prescribing a medicine causing symptoms similar to those to be cured, and in a future article, I intend to produce proofs of the accuracy of this doctrine, but am now going to enter more immediately into the doses of the Homœopathists.

He who has been used to the ordinary doses of medicine—to the nauseous compounds generally administered to the sick—no doubt will think that the world is going wrong, or that people have lost their senses, when he is told that there are men who profess to cure disease with 1000th part of a grain of medicine; and when such a dose is viewed in connection with our previous ideas concerning the powers of medicine, no doubt there seems something so ridiculous in the idea—something so repugnant to common sense—that we are led perhaps too hastily to form opinions hostile to the whole race of Homœopathists; but I would beseech every lover of truth to examine before he condemns.

In the first place, the medicines of ordinary practice are hardly ever given pure; in the next place, the diet of Homœopathy is such as to preclude the possibility of any interruption from substances which exert any medicinal action. All raw vegetable juices, all spices, all essences, odours or perfumes, all theiform infusions, and all that can by any possible means be supposed to exercise the slightest influence over the organism, are rigorously excluded. In the third place the principle which animates the body rises in rebellion against a violent attack; thus, when a large dose is administered, nature is roused to reject the intruder immediately: hence abundant evacuations of all sorts, caused by the largeness of the dose; while a minute dose is left to act on the organism slowly, gently, and undisturbedly, and thus to produce, without excitement, all that kindly influence which is soon cut short by a storm of reaction, in which all the individual and peculiar symptoms of the medicament are lost in inextricable confusion.*

The doses of homœopathy, moreover, are destined to act upon the part of the organism which is already affected: in other systems, they are given to produce symptoms in a different part of the body to that affected; as, for instance, a purgative for headache, a diuretic in a case of anasarca, &c., &c. But there is a vast difference in these modes which does not appear at first sight. "A blow, for instance, which would inflict very little pain, if a sound part of the body were struck, would cause great agony if it fell on a festered finger. You may catch a cricket ball in a sound hand, while, when it is scalded or bruised, you can scarcely bear the gentlest air of a summer evening to come in contact with it. The eye, which when uninjured can steadfastly watch the lark half way up to heaven, when it is inflamed cannot bear the irritation of a chamber lamp." These facts speak for themselves; they prove that the power possessed by a medicine is greatly increased by being directed against that part of the organism which is already affected.

But I have been arguing thus far as if medicines in homœopathic practice were prepared in the usual way, and as if the action of medicine were material—not dynamic. All medicines used by homœopathists undergo a long course of trituration and assimilation, generally in a glass mortar.† They are always kept in glass vessels and defended from the action of light. Will any one who has seen the power developed by rubbing a cylinder of glass with a piece of silk (which power will

* The following is Hahnemann's exposition of the reaction of medicines:—"Every agent that acts upon the human economy, every medicine produces, more or less, some notable change in the existing state of the vital powers, or creates a certain modification in the health of man, for a period of shorter or longer duration: this change is called the *primitive effect*. Although this is the joint effect of both a medicinal and a vital power, it belongs, notwithstanding, more particularly to the former, whose action is exercised upon the body. But our vital powers tend always to oppose their energy to this influence or impression. The effect that results from this, and which belongs to our conservative vital powers and their automatic force, bears the name of *secondary effect* or *re*-action.

* Everest's popular view of Homœopathy.

† In a future number the method will be given at length.

shake with agony the frame of the most powerful man) deny that a similar power may be communicated to medicine, by long trituration, or, at least, that a latent power may be developed? Thus much we do know, that medicines which are generally considered inert, such as chalk, silica, carbon, metallic gold, &c., by trituration acquire powers hitherto not ascribed to them, and it is indeed surprising that men of science never discovered this latent power, knowing as they did that mercury in its primitive state is inert, but that by mere trituration and minute division it becomes a powerful medicament,—it is surprising, I say, that this remarkable fact escaped their observation: but homœopathy has opened a new path in this department, and let us hope for better things.

Medical men have been so led away by the idea that the immediate cause of disease was material, that they have invariably until Hahnemann's time adopted, and do still adopt, the idea that the action of medicine is material: whether this is the case or not, the following case, which was published in the Lancet of Dec. 21, 1839, will perhaps exemplify:—

"X. Y., aged about 25 years, applied to me for relief, for a severe toothache. Upon examining his mouth, I found a small excavation in the crown of the second bicuspis of the upper jaw; the tooth bone was firm and healthy, the enamel only slightly injured, and the surrounding gum and mucous membrane unaffected. Under these circumstances, I advised the stopping of the cavity, with a view to save the tooth, an operation which I have performed with success in numerous instances. The preparation which I used upon this occasion, for that purpose is an amalgam of silver and mercury; the quantity introduced into the hollow of the tooth was six grains, of which one fourth was mercury.

"In twelve hours the amalgam had become firm, and the nerve, protected from the influence of the external air, had ceased to be painful.

"In twelve days from this time I was sent for to this man, and found him labouring under severe ptyalism; I removed the stopping from the tooth, and, upon inquiry, no other cause could be ascertained for this attack than the small proportion of mercury (1½ grs.) thus brought into contact with the salivary fluid. His constitution was good; he was a married man; had never suffered from disease of any kind, and had occasionally taken a blue pill as an aperient, without suffering any inconvenience."

Now this is a case which exemplifies a point which is of extreme importance in the administration of medicines; viz., that a much less quantity than is ordinarily given is sufficient to produce violent effects on the system: for in this case 1½ grs. was the whole quantity of mercury contained in the tooth, and the stopping, we are told, was taken out, and no mention made of its diminution of bulk: it was still there, and it would, perhaps, have astonished the medical man had he weighed it, to have found no appreciable diminution of the weight of the mass: that such would have been the case I feel certain. Moreover, the power supplied to, or rather generated in, homœopathic medicines was (by the contact of the two metals) in this amalgam rendered feasible. But it thus is accounted for by the author of the article: "Under these circumstances, and from careful inquiry with regard to his preceding habits, aided by the opinion of the physician attending the patient, I have been obliged to come to the conclusion that this must be a case of peculiar idiosyncracy." No doubt! but if so, why did not the blue pills act in like manner? I know of but one reason, and that is a woman's—"because they did not" unless homœopathy is true.

The action of medicine is but little understood by the present race of medical men; but Hahnemann has set the example, and we may now hope that an uncertain art may be brought to deserve the name of a science, and that its results, when applied to the cure of disease, may be calculated with mathematical precision.

(*To be continued.*)

RESULTS OF EXPERIMENTS PERFORMED, WITH A VIEW OF DETERMINING WITH GREATER CERTAINTY THE DISTINGUISHING CHARACTERISTICS OF THE STAINS OF ARSENIC AS OBTAINED FROM MARSH'S APPARATUS.

BY P. H. HARPER, HENLEY-IN-ARDEN.

The theory of the action of Marsh's apparatus is so well known, as hardly to require mention. Hydrogen gas is formed in the midst of the solution suspected to contain arsenic: this gas has to be burnt on coming out of the apparatus, and the products of this combustion are to be examined. It is one of the properties of hydrogen to form with arsenic a compound called arseniuretted hydrogen, which burns like common gas, and leaves as a residue a sort of metallic soot; and if, after the gas is set on fire, a piece of glass, or a porcelain plate be presented to the flame, the combustion is thereby retarded, and a metallic ring is deposited

on the glass or plate. No other substances at present known yield metallic stains from this apparatus, except arsenic and antimony; therefore the first thing required is to distinguish between the stains obtained from these two substances. The stains obtained from arsenic on a porcelain plate, (which, by the way, I should always recommend as preferable to glass, as being liable to fewer objections and likewise more convenient), are round, of a bright grey shining metallic appearance, surrounded with a ring of white matter, gradually losing itself on the plate, while those obtained from antimony are of a dull white, of no particular form, and without any of the shining appearance of those of arsenic.

The stains obtained from arsenic are totally sublimed by heat. They are soluble in nitric acid at ordinary temperatures; and if a stick of nitrate of silver be applied to this solution, it forms a yellow precipitate which remains unaltered on the addition of pure ammonia. Again, if the stains be dissolved in nitric acid, which must then be diluted with distilled water, and saturated with pure potassa; and if ammoniacal nitrate of silver be added to this solution, it will produce its characteristic light yellow precipitate, becoming black on exposure to light. Also, if the ammoniacal sulphate of copper be allowed to digest for a few hours on one of the stains, it will produce the precipitate usually described as apple or grass green, but much more inclined to a dirty yellow green; while speaking of the ammoniacal sulphate of copper, I would beg leave to draw attention to the fact, that if a solution of nitric acid and water be saturated with carbonate of potassa and the ammoniacal sulphate of copper be poured upon them, it will produce a beautiful apple or grass green precipitate, which though very different from that obtained from arsenic when they are placed side by side, yet, from the description usually given, it might mislead: nitrate of potassa itself does not produce the same effect.

In addition to the above means, I would recommend the plan lately suggested by M. Lassaigne* viz. "To drive the gas disengaged from Marsh's apparatus through a solution of nitrate of silver; the arseniuretted hydrogen is gradually decomposed by the oxide of silver; the latter is then reduced, and metallic silver is deposited, arsenious acid being produced and remaining in solution with the excess of nitrate of silver employed. Hydrochloric acid is added to the solution which is then filtered and evaporated at a gentle heat in a porcelain capsule. During the concentration and evaporation, the nitric acid contained in the liquor acts on the arsenious acid, converting it into arsenic acid. This latter forms the residue of the evaporation, and it is then easy to ascertain the chemical properties." The stains obtained from antimony produce none of the above characteristics. From a quarter of a grain of arsenious acid, I have produced enough stains to perform the first experiments; and then to act upon the latter, and I likewise think, that if all of the above characteristics appear, we may be able to swear most positively, as to the presence of arsenic in any solution; and if it be animal matter which contains it, we may prepare it by nitric acid, &c. as recommended by Orfila, and then use the above mentioned means.

* See *The Chemist*, Vol. I. p. 347.

ON THE ADULTERATION OF DRUGS.

BY CHARLES WATT.

At various times we have had occasion to call the attention of our readers to the numerous frauds and adulterations practised in the chief articles of life, by those engaged in the respective businesses destined either to manufacture, or dispense them to the public. We have given detailed accounts of the adulterations of porter, bread, gin, &c.; it is now our lamentable duty to draw the attention of chemists, and indeed of the whole community, to a species of cruel and nefarious atrocity; and the task is more repulsive to us, as it affects that body to which our pages are more immediately addressed. We allude to the adulteration of drugs—a practice more infamous, sordid and cold-blooded, disgraces not the annals of crime, nor deserves greater severity of punishment. In matters of common concern to cheat any one, particularly the poor, is indeed base enough; but to deceive the sick and afflicted, and to defraud him of the fondly cherished hope of relief from the means intended for his restoration, is a turpitude which no language can denounce with due execration. No mind can but hold in abhorrence the wretch who is guilty of such villany. Who, that has visited the bed of sickness and approaching death, has not marked the eagerness—the restless anxiety with which the sufferer looks to, and inquires for the remedy which he hopes and believes will restore him to health and vigor! Quickly does he swallow the nauseous draught, and then in calm and tranquil resignation reposes on his gloomy couch awaiting the wished-for benefit. His hopes, alas! are soon defeated. Indeed, avarice has interposed its cloven foot in cases where medicine would have done good and dashed them from him.

Tempted by some trifling reduction in price, some parties are induced to stock their shops with inferior articles, or being in debt to the wholesale dealers, are obliged to take such as are sent. Hence is all concern for the goodness of the medicine, or the health of the patient, totally lost sight of and neglected.*

But what is still more frequent and more culpable from the rank of the individual, is the apothecary,† calculating more on the cost of renewing his stock, and laying aside his stale drugs, than on the good of the patient, compounds his medicines and prescriptions with drugs, which long since ought to have been burned or cast to the winds. We here speak of a practice too common to admit denial. It has come to our knowledge from authority the most undoubted, that in London, Birmingham, Bristol, Liverpool, and other large towns, it is only at a very few of the first-rate houses, that drugs of really genuine quality can be obtained.

It is our intention to examine those from different houses, and from time to time to give accounts of our results.

In former numbers of the Chemist, we have, recommended the establishment of a Board of Commissioners, with power to regulate the Drug Trade, and to punish such as break the law by the employment and disposal of bad articles. We are forming means of testing the various substances appertaining to Pharmacy, and are not without well-grounded hope of being able to detect any impurity or bad quality in them. It is our intention to keep samples of genuine articles, and to examine and compare any sent to us, and report their quality.

Before concluding, we may mention a few of the frauds and the means by which they are accomplished; for instance, the adulteration of jalap is with a damaged kind of linseed meal, &c. Epsom salts are mixed with glauber salts peculiarly crystallized, and sold at low shops, *ticketed* for a half-penny per ounce. Sulphate of quinine is much sophisticated: it is mixed with cheaper bitters, and even with magnesia. Balsam of copaiba is mixed with castor oil, and even turpentine. To get the essential oils in a pure and genuine state is next to impossible: only let any one try, by promiscuously purchasing them at any two shops, and the truth will soon be made manifest.

As we shall have but too often, we fear, to recur to closer and more minute details on this subject, we must leave any further particulars for the present; but we cannot do so without hoping, and earnestly invoking the due consideration of the subject by Parliament in the approaching Session, and that Mr. Hawes, (to whose industry and adaptation for business the community is already under heavy debts of gratitude for many valuable amendments in the laws), will introduce into his Medical Reform Bill, clauses to compel the examination of druggists as to their qualifications, and to establish a suitable Board of Commissioners qualified to test the purity of drugs, and with power to punish any infractions of the law with adequate fines, suspension, or other penalty. Great, indeed, would be the benefit to the public from such an enactment as we have suggested, redounding incomparably more to the honour and credit of Parliament and Ministers, than raising by despotic force an enormous revenue from the vices of the people.

* Our eye is on these parties, and whenever we detect any fraud committed or sanctioned by them, we shall not fail to give it in detail. Our object is to protect the public and fair dealers—others must be on their guard.

† The long time which certain articles are kept by this class, often causes them to become quite inert: we have frequently seen instances in which, from penury or neglect, medicines have been totally spoiled.

MEDICAL REFORM. — ADULTERATION OF DRUGS. — MR. HAWES' BILL.

Gentlemen,—With many others I am gratified to think, that in "The Chemist," we have a publication devoted to the true interests of our trade, the pages of which are open to the contributions of its subscribers, to express their opinions and their wants; to a statement of the evils which environ them, and for which they and you are seeking a remedy.

From the generally acknowledged fact that Mr. Hawes's Medical Reform Bill is the bill of the Profession—the one which they will support in opposition to that of Mr. Warburton—but little doubt exists that this is the bill which we are to have, (if we have any,) modified by those circumstances which party or individual interest never fails to produce.

Now, in many of the medical profession there exists a strong feeling of dislike and distrust to chemists and druggists. A part of this may result from the "counter practice" of the latter, or from so many of them "quacking" in some way or other; and so, trenching on the peculiar duties and profits of the profession, make its members view this irregular practice as an evil which ought to be put down. But the jealousy

and rivalry existing between the practitioner and the druggist will ever, without a separation of their distinct callings, marked by some legislative act, prevent their co-operation.

After giving, in your December number, an abstract of Mr. Hawes's Bill, you alluded to the necessity of an inspection of druggists' shops, and suggested that clauses embracing this feature, should be added to it. But the whole system of the trade is so corrupt, that I am satisfied nothing but a *parliamentary inquiry into the state of the wholesale and retail drug trade*, including in that, the adulteration of drugs, the irregular practice of druggists, the per centage system, and quackery, will ever induce the legislature to adopt, in any "Reform of the Medical Profession," those stringent measures which the present degraded state of the drug-trade imperatively calls for.

This, then, appears to me to be the first thing for which the chemists and druggists should petition. Whatever measures affecting them appear in Mr. Hawes's bill, must have originated from evidence adduced by members of the medical profession alone, and not from themselves. Why the physicians, surgeons, and apothecaries, should have been examined (in the Parliamentary Inquiry of 1834) relative to their several callings, and not the chemist and druggist, is an anomaly that I cannot account for. Now is the time to remedy this. Meetings should be called in every town—petitions to parliament prepared—a central committee appointed in London—and, if necessary, a parliamentary agent engaged to watch the progress of this, or any other bill which may affect their interests.

To the trade generally, the extent of adulteration in drugs may not be known, but enough is certainly known to justify them in petitioning for a thorough system of inspection from the IMPORTER down to the DISPENSER. In what body to vest this right of search must be a subject for careful consideration. No government favouritism—no family interest—no poor relation unprovided for—should be allowed to interfere in the selection of individuals for so responsible an office. I might, if it were necessary, point out some curious instances of the ignorance of government officials in connexion with the drug trade. Not many years ago spirits of nitre, aromatic spirits of ammonia, and æther, were manufactured in Scotland and in the Channel Islands, and sent into the London and other markets at much lower prices than they, in consequence of the high duty on spirits, could be made in England. But no one for a moment imagined that any spirit lay concealed in these articles, until one or two manufacturers of them, feeling so shocked at his Majesty's revenue being defrauded in this way, (and their own trade falling off in the same proportion,) gave notice to the Board of Excise. Even at this present time it is strongly suspected that some of the naphtha which finds its way into the English market from Scotland, Ireland, and elsewhere, is made to order from the same material. The duty of inspection must, for obvious reasons then, be vested in individuals of character and integrity, who are well acquainted with drugs and chemicals; and, who are also capable of testing and analysing them. To satisfy all parties, the inspector should undergo a rigid examination by a competent authority before being appointed.

This system of inspection is one thing which Mr. Hawes's Bill does not provide for; it is a thing essential, equally to the well-being of the drug trade, and the medical profession. Provision for this, for the immediate and unconditional extinction of quackery, and for the examination and licensing of chemists and druggists, appear to me absolutely necessary in any measure which the legislature may have in contemplation.

I have presupposed in my remarks, that, in our trade, at least, the old maxim of "Honesty is the best policy" is not entirely forgotten. If there be any who would prefer living a life of meanness and degradation, wanting only the act of publicity to call forth the blush of shame, or the righteous judgment of the law; by such this reformation will be viewed with distrust and hatred: but by the honest and upright it will be anticipated with pleasure, as a means of placing him on an equality with his dishonest and rapacious neighbour; and who will have the additional satisfaction of knowing, that his occupation in business does not degrade his character as a man.

Wishing you, Gentlemen, in the second and succeeding years, that success which your exertions, and the character of your publication deserve,

I remain,
Your humble Servant,
A DRUGGIST.

Dec. 7th, 1840.

[We entirely agree with "A DRUGGIST" as to the necessity of the system of inspection which he proposes, and the assistance of our advocacy shall not be wanting in so righteous a cause. All our influence shall be used towards the attainment of the various objects which we consider of importance to the welfare of chemists and druggists. We hope that something will be done in the ensuing session of parliament.

We also agree with our correspondent as to the propriety of meetings being called, and of the formation of a central committee; and we advise the trade to adopt these mea-

sures. Our assistance will ever be afforded towards the furtherance of their objects.]

LATE HOURS AND SUNDAY TRADING.

Plymouth, November 30th, 1840.

To the Editors of the Chemist.

GENTLEMEN,

The opportunities which your useful work affords to druggists, of making public their grievances, and of offering any suggestions, that may tend to ameliorate the condition of their fellow tradesmen, have induced me, (knowing your willingness to promote the welfare, and to maintain the rights of that body), to call your attention to the benefits that would accrue to druggists and their assistants from closing business at an earlier hour. To those who are actively employed in a shop from 7 A.M. till 11 P.M. fatigued and harassed as they must naturally be, what pleasure can there be in taking up even a light work to read, much less then to pore over the pages of such dry subjects as chemistry, anatomy, geology, &c., which cannot animate the weary mind to improvement, because they do not combine amusement with instruction, and not being sufficiently attractive, are calculated to produce in the minds of young persons rather a distaste for such studies, than an incitement to excel.

Druggists ought to be a well instructed class, perfectly conversant with every branch of their trade, and well informed on most other subjects; but if they have to toil incessantly in business, what time can they have for study or recreation, or what time to enjoy the peaceful comforts of a domestic circle? Even devotion yields to business; there are few druggists I think who open their bibles above once a week, many not so frequently, and even when they do, they are so liable to be interrupted, that they can feel very little interest in what they are reading; many a youth would gladly sit down to his bible for half an hour of a day, but in the present state of affairs such a thing is impossible; business is the *summum bonum* with all, and must be attended to, even to the neglect of other duties, equally, if not more, important.

But to whom, let me ask, is the fault of such want of leisure to be attributed? To the Public?—No.—To whom then can it be attributed but to the druggists themselves? There exists such a jealousy among them—such a want of confidence in each other—that no one dares to set the example by closing his shop, fearing that the others will not comply, and that he may thereby lose customers; the reform must begin with themselves, the public they may be assured, will never make the slightest endeavour to lessen their labour; why should they? but on the contrary, while they find that they can get their medicines as well at 10 o'clock as they can at 8, they will never put themselves to the least inconvenience by applying earlier.

Let the druggists therefore unanimously follow the example set them by the bankers, and close their businesses at an earlier hour, and the public must conform; they will then have a time for study and recreation, a time for devotion; a time for all things; the better disposed of their assistants will apply themselves to the study of such subjects as it is requisite for them to be acquainted with; they will attend lectures and other places of instruction and improvement, and the druggists will soon become not only a more intelligent and respectable, but a happier class of society.

With many hopes that this may attract the attention of those who may be influential in bringing about a change, and that the suggestion that I have ventured to make may be acted upon so as to procure a little leisure for those to whom it would be beneficial,

I remain,
Gentlemen,
Your most obedient servant,
F. B. B.

ON OPACITY OF THE CORNEA PRODUCED BY SULPHURIC ACID.*

BY R. D. THOMSON, M.D.

THE rapid destruction of sight, consequent on sulphuric acid being brought in contact with the cornea, has long been well known to surgeons. But Dr. Thomson was not aware of any accurate investigation of the cause having been entered into. The subject came under his consideration from having attended a case with Dr. Maddock, in which the vision of the right eye was destroyed, in consequence of a woman having, in a fit of passion, thrown a quantity of oil of vitriol at a man. According to the sufferer, the corrosive fluid was in contact with his eye only about two minutes, when he had an opportunity of washing it off with water. Yet permanent opacity of the cornea had taken place. It naturally occurred, from a consideration of this statement, that the agency of the acid could not have extended to any very considerable depth. The anatomical structure of the cornea likewise favoured

* Medical Section of the British Association. From *The Athenæum*.

this conclusion. This important part of the eye is constituted of laminæ of transparent albuminous membrane, each of which is separated by a stratum of fluid matter. These laminæ can be readily separated by the point of a knife. But in addition to these laminæ, the conjunctiva covers the whole of the anterior surface of the cornea, so that this latter membrane may be considered as the external lamina. During health the cornea is perfectly transparent: but when any cause comes into operation which prevents the free secretion and absorption of these fluids, probably from the abstraction of the aqueous portion and the greater condensation of the albumen held in solution, it happens that the cornea becomes dull and somewhat opalescent, and that peculiar appearance is produced, so familiar to the physician in the eyes of his patients. When heat is applied in the proximity of the dead cornea of the sheep, the dulness of the cornea immediately becomes apparent, a phenomenon which is to be explained by its action upon the albumen. Even without the application, however, of any external agent, the dead cornea has a glazed aspect, which is to be attributed to the action of the absorbents after death, and the consequent abstraction of the more fluid portions. When nitrate of silver, in a moistened state, is brought into close and extensive contact with the cornea, a white curdy appearance takes place, which is, in the first instance, produced by the decomposition of the common salt contained in the fluid which lubricates the eye. The secondary action is to form chemical compounds with the conjunctiva, and if the quantity of nitrate is sufficient, to extend the destructive agency to the various laminæ of the cornea. The nature of those compounds was described in a previous communication to this section at Newcastle. When sulphuric acid, or common oil of vitroil, which is a very impure substance, is brought into contact with the dead cornea of the sheep, in three or four seconds, if the experiment be watched under the microscope, the acid, which appears to swim about freely on the surface of the cornea, produces a milkiness; in half a minute, a white opacity; and in from one and a half to two minutes all translucency is destroyed. If the cornea, which has been previously extended on glass, be now plunged into water, and washed free from sulphuric acid, a permanent opacity will be found to have taken place precisely as in the case of those unfortunate individuals who have been deprived of vision by sulphuric acid in the manner already described. If we now make a section of the cornea which has been acted on by the acid, we shall find that the action has been very superficial, and that the upper and under surface of the opaque portion are parallel —and hence the influence of the acid would appear to have extended equally. If the section be now made at right angles to the axis of the eye, so as to separate the opaque from the uninjured portion, the transparency of the cornea appears to be perfectly restored, and the only defect, when a careful examination is made by the microscope, appears to proceed from the uneven surface produced by the section. But the opaque portion may likewise be readily separated, by scraping it with the point of a knife—so decided is the limit between the uninjured and opaque surfaces. It would appear from these facts, that the action of the sulphuric acid is to produce a new or false membrane, which is not removed by nature, as some other false membranes are, in consequence of its forming part of a solid body; they serve also to confirm the opinion stated by the author in a communication read at the Bristol meeting—that false membranes, as in croup, balanites, bronchitis, &c., are the consequences of the presence of an acid preternaturally secreted in the fluids of the mucous membranes where these deposits occur—the organization of the albumen taking place under the coagulating influence of the acid. The treatment of opacity of the cornea produced by the action of sulphuric acid appears to be elucidated in no small degree by these facts;—if the acid be neutralized in the course of a few seconds, little or no injury is sustained by the cornea; but as in thirty seconds considerable opacity has occurred, and some portion of false membrane has been formed, it will be necessary to have recourse to the knife, which may be safely employed to scrape off the preternatural deposit. The author observed, that he intended to propose the operation to the patient described, so soon as the granulating action now affecting the eyelids had been subdued.

ON CERTAIN FERRUGINOUS PREPARATIONS.

BY M. BERAL.

A work undertaken with the view of rendering the preparations of iron used in medicines still more perfect, has led me to the discovery of many ferruginous preparations not yet studied, or but little known. I will describe the most striking properties of these products, while I am completing that which I have already published concerning these compounds in general, and more particularly as regards the citrate of iron. I may seize this opportunity for communicating the formulæ for several medicines—which are beginning to be much used, and which formulæ have not been published in any work.

CITRATE OF PEROXIDE OF IRON.

Citrate of peroxide of iron is obtained under the form of transparent bractese of a fine garnet colour. This very remarkable salt may be dissolved in water with the greatest ease: its solution is stable and its taste is not very strong. It is the basis of many pharmaceutical compositions, on which I shall treat in a future article.

CITRATE OF PROTOXIDE OF IRON.

This salt is prepared by treating iron filings with citric acid previously dissolved in distilled water. It is white, pulverulent and not very soluble. The action of light quickly colours it, and damp air modifies its constitution, making it pass to a different degree of oxidation. Like the other salts of the protoxide of iron, it has a very atramentary taste.

CITRATE OF OXIDE OF MAGNETIC IRON.

Combined with citric acid, oxide of magnetic iron, yields an uncrystallizable salt, of a green colour, and susceptible of forming transparent bractese. This salt is soluble and very active, but it has a very powerful atramentary taste. It is a remarkable fact, that its solution undergoes no alteration, but retains its green colour, even when exposed for a length of time to the action of atmospheric air.

CITRATE OF IRON AND QUININE.

Citrate of iron and quinine is a new salt, much wanted in therapeutics. This medicine is formed by combining four parts of citrate of iron with one of quinine. It is obtained under the form of transparent bractese, soluble, very bitter, and of a garnet colour.

Owing to its great bitterness, it can be conveniently administered only in the form of pills.

FERRUGINOUS WINE OF QUINQUINA.

Composed of elements supposed to be incompatible, the ferruginous wine of quinquina constitutes a new medicine, the want of which has constantly been felt, and which, in the hands of physicians, will be the subject of many useful applications.

Fifty parts of this wine contain one part of citrate of iron, and the soluble principles of three parts of quinquina. The quantity of citrate may be increased at pleasure.

TANNATE OF PEROXIDE OF IRON.

This salt is obtained by adding tincture of gall to a solution of a peroxidised salt of iron. It is blue, insoluble and tasteless. Its properties are not very remarkable.

SYRUP OF TANNATE OF IRON.

R.	Simple syrup . .	375 gram.
	Syrup of raspberry vinegar	125
	Citrate of oxide of magnetic iron . . .	10
	Extract of nutgalls . .	4

Prepare *secundum artem*.

Many physicians use the tannate of iron in the form of syrup. As the iron, in this preparation, is in the state of ferro-tannate of the protoxide, and associated with an acid, it is soluble, sapid, and susceptible of many useful applications.

SYRUP OF IODIDE OF IRON.

R.	Simple syrup . .	200 gram.
	Liquid iodide of iron .	1

M.

Every tea-spoonful of this syrup contains one gramme, or five centigrammes, of dry iodide.

As soon as a solution of iodide of iron is put in contact with atmospheric air, one part of the iron is oxidised, and a corresponding quantity of iodine is liberated. This circumstance, unfortunately, modifies the action of the medicine, and very much prejudices its use.

Water saturated with sugar possesses the power of resisting the oxidation of iron. Therefore, it is only under the form of syrup that it can be administered.

SACCHARATE OF LIME.

Simple syrup . .	1000 gram.
Quick lime . .	10
Water . . .	100

Slake the lime with the quantity of water prescribed; add the mixture to the syrup; boil for ten minutes, and filter. Add to the product four times its weight of simple syrup.

Professor Trousseau was the first to whom the idea of using this medicine occurred, and experience has shown him that it would be inconvenient to use this syrup at a higher degree of concentration. It is used in chronic and obstinate diarrhœa.

LACTATE OF IRON.

The following is the process which I have found most successful:—

500 grammes of lactate of lime are dissolved in 2 kilogrammes of boiling water; the lime is precipitated by means of oxalic acid, which forms an insoluble oxalate, and it is filtered. The liquid obtained contains lactic acid, which, put in contact with iron filings, and heated for six or eight hours, yields, on cooling, very white lactate of iron, in a crystalline powder; nothing remains to be done, beyond separating it from

the excess of iron, washing it with alcohol and drying it.

By treating peroxide of iron with lactic acid, I have obtained a red, soluble lactate of iron; but I have not yet studied it sufficiently to enable me describe its characters.

MARSH'S APPARATUS FOR DETECTING ARSENIC.*

The recent trial of Madame Laffarge at Tulle, for the murder of her husband by administering arsenic, has given rise to much angry discussion among the French chemists, owing to the different results arrived at by those employed to analyse the decomposed remains of the deceased. M. Raspail denies the correctness of the experiments made by M. Orfila, who detected arsenic in every part of the putrid mass submitted to experiment. It seems, indeed, admitted that the delicacy of the test for arsenic afforded by Marsh's process is liable to cause dangerous inferences from its power of detecting the most minute particles of the poison; and as it is now found that the human body always contains a minute portion of arsenic, the effect of any analysis so refined may induce the belief that the cause of death is the poison inherent in the human frame. These discoveries and discussions have caused attention to be more directed towards Marsh's apparatus, and suggestions to be made for the improvement of it.

The process itself consists essentially in making hydrogen gas, in the ordinary gas apparatus, from the solution suspected to contain arsenic. If arsenic really exists in the liquid, it will combine with the hydrogen produced, so as to form arsenuretted hydrogen gas. This gas is burned as it issues from a tube fitted to the vessel in which it is produced, and by receiving this flame on earthenware plates, small quantities of arsenic are collected, spread over the surface in bright metallic spots, the nature of which can be determined by the usual tests; that is, by nitric acid, which converts metallic arsenic into arsenic acid; then with the nitrate of silver, which forms with it an arseniate of silver, of red brick colour.

This process is simple, but it is attended with several inconveniences. If the gas be inflamed too soon there is the risk of detonation, and the vessel will be broken to pieces. A large quantity of the arsenuretted hydrogen is lost at the same time. If the ignition be deferred, so as to avoid the risk of explosion, a portion of the arsenic may escape. In short, it becomes difficult to perform the operation so as to obtain the arsenical spots, notwithstanding the presence in the liquid of even a large quantity of arsenic; though the process will detect the most minute quantities, if rightly managed. Those who have performed the experiments know that the angle at which the plate is held to receive the flame, and the size of the flame itself cause the results to vary, and nothing certain has been fixed, either as regards the degree of inclination or the size of the flame. To remove these causes of error, M. Lassaigne proposed to make the gas pass though a solution of pure nitrate of silver. The arsenuretted hydrogen gas mixed with the hydrogen is then decomposed by degrees by the nitrate. The silver is precipitated in black flakes. There is produced arsenious acid mixed with the excess of nitrate of silver. This excess of nitrate of silver is decomposed by chloriodic acid; it is thus converted into a chloride; it is filtered, and the chloride and the metallic silver are separated from it. The filtered liquor is heated; the nitric acid which it contains re-acts on the arsenious acid, and converts it into arsenic acid; the properties of which are ascertained by the ordinary means. M. Lassaigne is of opinion that this process would detect one milligramme of arsenious acid dissolved in a thousand grammes of water; that is, in the proportion of one-millionth part, or of about one grain of arsenious acid in 18 gallons of water.

Some objections have been raised against the process of analysis by Marsh's apparatus; one of which is founded on the multiplicity of the operations necessary to discover such small quantities of arsenic. But the strongest objection, if well founded, proceeds from M. Raspail, who asserts that the nitrate of silver is as uncertain a test of arsenic as sulphuretted hydrogen, and that the red brick colour may be obtained by means of that nitrate on other metallic spots produced by Marsh's process, which have all the appearance of arsenic, though they contain not an atom of that metal. The acetate of iron, mixed with a phosphate, especially with an iodide, will, according to M. Raspail, produce these false appearances of arsenic. Besides, he affirms that the red colour is of so many different shades that it can only mislead.

M. Raspail, after having endeavoured to detract from the value of nitrate of silver as a test of arsenic, proceeds to examine the process of M. Lassaigne, which he thinks equally fallible with the other. But in order to show the uncertainty of Marsh's apparatus, it must be proved that any other metallic spots produced thereby, besides arsenic, can be volatilised at a low degree of

* From the *Inventor's Advocate and Journal of Industry.*

heat, easily dissolved in nitric acid, and are coloured red by nitrate of silver. This M. Raspail has failed to do.

The doubt, however, which exists respecting the application of the process in the trial of Madame Laffarge does not depend on the nature of the metallic spots, but merely as to the source whence such small quantities of arsenic as were found came. With a view to establish more satisfactorily the results of the analysis made at Tulle, M. Orfila has been instituting fresh experiments in Paris before a commission appointed by the Academy of Medicine, for the purpose of showing the action of arsenic on the body of animals, and the mode of detecting it after death. Two dogs were killed, one by arsenic and the other by hanging. On examining their bodies twenty-four hours after death, the urine of the poisoned dog exhibited manifest indications of arsenic by Marsh's apparatus, whilst that of the other dog exhibited no trace of it. Portions of the liver of the two dogs were submitted to the test of Marsh's apparatus, with similar results; in the liver of the one which was hanged no arsenic was detected, whilst the liver of the poisoned animal gave decided evidence of its presence. M. Orfila has determined in the course of his experiments, that arsenic when taken in quantities not sufficient to produce death is quickly carried from the system by the urine, and therefore he concludes that it is indispensable in the treatment of persons who have taken arsenic to favour the secretion of urine as much as possible.

ON POISONS, CONTAGIONS, AND MIASMS.*

BY PROFESSOR LIEBIG.

At the meeting of the British Association, Dr. Playfair said, that at the request of the author, he had prepared a statement of Prof. Liebig's new views on the subject of poisons.

Poisons may be divided into two classes, those belonging to the inorganic and organic kingdoms. Many substances were called inorganic poisons which had in reality no claim to be considered as such. Sulphuric, nitric, and muriatic acid, when brought into contact with the animal economy, merely destroyed the continuity of the organs, and might be compared, in their *modus operandi*, to the action of a heated iron, or a sharp knife. But there are others—and these are the true inorganic poisons—which entered into combination with the substance of the organs without effecting any visible lesion of them. Thus it is known, that when arsenious acid or corrosive sublimate is added to a solution of muscular fibre, cellular tissue, or fibrin, these enter into combination with them, and become insoluble; when they are introduced into the animal organism, the same circumstance must happen. But the bodies formed by the union of such poisons with animal substances are incapable of putrefaction; they are incapable, therefore, of effecting and suffering changes; in other words, organic life is destroyed. The high atomic weight of animal substances explains the cause of such small quantities being requisite for producing deadly effects. After stating several chemical details on this subject, it was shown that to unite with 100 grains of fibrin, as it exists in the human body, (in which it is combined with 30,000 parts of water) only 3½ grains of arsenious acid are necessary, or 5 grains of corrosive sublimate. The second class of poisons were those belonging to the organic kingdom. For some such substances as brucia and strychnia, no data exist by which it can be determined to what cause their action may be assigned. But the morbid poisons, such as putrid animal and contagious matter, appear to owe their action to a peculiar agent, which exerts a much more general and powerful action than chemists are aware of. Thus, when oxide of silver is thrown into peroxide of hydrogen, the oxide is reduced, and metallic silver remains. Here there can be no affinity, for oxygen can have no affinity for oxygen. It is merely that a body in a state of motion or decomposition is capable of inducing upon or imparting its own state of motion or decomposition to any body with which it may be in contact. There is a disease frequently produced in Germany by using decayed sausages as an article of food. The symptoms attending the disease are remarkable, and distinctly indicate its cause. The patient afflicted with the disease becomes much emaciated, dries to a complete mummy, and finally dies. The muscular fibre and all parts similarly composed disappear. The cause of this evidently is, that the state of decomposition, in which the component parts of the sausages are, is communicated to the constituents of the blood, and this state not being subdued by the vital principle, the disease proceeds until death ensues. It is remarkable that the carcases of the individuals, who have died in consequence of it, are not subject to putrefaction. The cause of the action of contagious matter is similar. It is merely a gaseous matter in the state of transformation, and capable of imparting the state of transposition, in which its atoms are, to the

* *British Association*; From *The Athenæum*.

elements of the blood. It is capable of being reproduced in the blood just as yeast causes its own reproduction in fermenting *wort*. The causes of the action of yeast and of contagion were shown to be the same, and examples were produced in which similar reproductions take place in common chemical processes. There are two kinds of yeast used in the brewing of Bavarian beer. The fermentation caused by one is tumultuous; that produced by the other is tranquil. They, therefore, induce the peculiar state of transposition in which their atoms are upon the elements of the sugar. The same was shown to be the case with the vaccine virus of cow and human small-pox, of which, one produces a violent action upon the constituents of the blood, whilst the other causes a gentle action quite distinct from the former.

Prof. Hannay said he could not exactly coincide with the views proposed regarding the action of inorganic poisons, as he was convinced the cause of their virulence was owing to something further than mere combination with the animal membranes; nor could he coincide in the comparison brought forward by Dr. Playfair, that sulphuric and oxalic acids merely acted like a heated iron, by destroying the continuity of particular organs. He thought that through the course of the inquiry chemistry had been too much kept in view, and that medicine had not been sufficiently consulted. It was singular to see us brought back to the time of Hippocrates, who also had affirmed that contagious matter was a kind of yeast acting in the blood.—Dr. Playfair explained that Prof. Liebig expressly states in his report, that this subject cannot be completed without the co-operation of physiologists; that he had therefore merely brought forward the purely chemical part of the inquiry, and hoped thereby to draw the attention of physiologists to its further investigation. Hippocrates had certainly compared the action of yeast with that of contagious matter, and the comparison was so apt that it could scarcely be avoided; but the merit of Liebig's views is, that he has explained the action of yeast, and shown that it is owing to a peculiar agent which has hitherto escaped attention, but which plays a very important part in the phenomena of combination and decomposition.

AMMONIO-TARTRATE OF IRON.

Dartford, Dec. 6, 1840.

To the Editors of the Chemist.

GENTLEMEN:

I wish to call the attention of the Medical Profession to a new preparation of iron, but little known, and I believe little used by that body of men, viz., the *Ammonio-tartrate of Iron*, made by Mr. Morson, from the formula of Aikins, a copy of which may be seen in Pereira's Materia Medica; it contains a larger proportion of iron than the sulphate of the same base, and may be given in either powder, pills, or solution, and is not readily decomposed, except by the fixed alkalies; it may be given in beer or porter without discovering the taste.

The above is a short description of this excellent preparation, which I hope will not intrude on your valuable pages.

I remain, Gentlemen,
A constant reader,
MEDICUS.

NEW MEDICAL TREATMENT IN GERMANY.*

At a recent meeting of the Westminster Medical Society, Dr. J. Johnson called the attention of the meeting to a new mode of treating disease, which has lately come into vogue in Germany. This is called hydrosudopathy, and it consists in subjecting the patient to the external action of hot and cold water alternately, accompanied by copious draughts of the latter. The patient is first wrapped in blankets, and made to perspire plentifully. He is then plunged into a cold bath, and having remained in it a short time, is taken out, and made to walk about quickly, till he gets warm again. He drinks cold water while in this state, and some persons have been known to swallow the enormous quantity of four or five gallons. He is then put into bed, and a second perspiration takes place. If it should be difficult to bring on perspiration again, the object is found to be speedily attained by wetting the blankets before the patient is wrapped in them. This method is used in all complaints, even in cases of violent pneumonia. Dr. Johnson did not seem to have a very high opinion of its efficacy; he stated that he had conversed with many German physicians on the subject, and the result he arrived at was, that it was not attended with disastrous consequences which at first sight might be expected from it. He illustrated the matter by the Russian custom of rolling in snow immediately after quitting the vapor bath, which he had himself witnessed.

The method of hydrosudopathy was invented by a Bohemian peasant, named Presnitz. Another gentleman who spoke stated

* *Inventor's Advocate.*

that the new mode was already on its decline in Vienna, where it had been longest known.

THE POCKET FORMULARY; *and Synopsis of the Pharmacopœias; comprising Standard and Appointed Formulæ for more than* 500 *officinal and extemporaneous compounds employed in Medical Practice; arranged in alphabetical order.* London: Sherwood, Gilbert and Piper.

This is an extremely convenient and useful little work, containing all that is required for most ordinary purposes. Every medical practitioner and chemist and druggist should carry it about him.

BOOKS RECEIVED.

Practical Remarks on the New Operation for the Cure of Strabismus, or Squinting. Illustrated with Lithographic Engravings by Bagg. By Edward W. Duffin, M.R.C.S.L. & E. London: *John Churchill.*

Agricultural Chemistry. By the Rev. C. A. A. Lloyd. Written and published at the request of the Members of the Shropshire Natural History Society, and delivered before them on the 3d of April, 1840. Shrewsbury: *G. Matthews,* High Street.

[The Copy sent to us unfortunately is imperfect, many leaves being out. If favoured with a perfect copy we shall be happy to notice it.]

A Tabular View of the Yearly Quantity of Rain which falls in different parts of Great Britain. By Joseph Atkinson, Harraby, near Carlisle.

TO CORRESPONDENTS.

Although we heartily approve of the laudable objects of the tract—"On the Duty of being Scientific," we cannot give insertion to it, as requested by its worthy compiler.

An Apprentice.—There is Dr. Ure's Dictionary: but we recommend the new edition of Dr. Turner's Elements of Chemistry, (a notice of which appears in the present No.) as being eminently calculated for a beginner.

Gulielmus. We consider oil preferable to naphths. Our correspondent will not find it practicable to manufacture his own gas.

Mr. Shaw will be attended to in our next.

N. R.'s communication on the subject of mercurial ointment and blue pill has been superseded by others; we have not, therefore, inserted it. The other subject shall be attended to next month.

Communications Received from A. B.; Mr. Henry Dunn; A Chemist and Druggist; P. H. G.; W. D.; Mr. Alfred Smith; G. F. D.; and Mr. Millns.

Will Mr. A. Walter, of Brighton, at whose conduct we are much surprised, favor us with a reply to our numerous letters, which we know he has received?

Medicus, and all our correspondents who have written us on the subject, are informed that all the numbers of The Chemist are now to be had of our Publisher.

Nota Bene.—*All Communications and Books for Review must be addressed, "To the Editors of The Chemist, care of Mr Hastings, Publisher,* 13, *Carey-street, Lincoln's Inn Fields, London." Communications must be pre-paid, and sent before the* 15*th of each month; Books for Review, before the* 10*th.*

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THE CHEMIST.

I. CHEMISTRY.

ON THE SOLUBILITY OF SILVER IN SULPHATE OF PEROXIDE OF IRON.*

BY M. VOGEL.

Some years ago, M. Wetglar, of Hanau, observed that a solution of sulphate of iron had the property of dissolving a small quantity of silver at the ordinary temperature. He had observed, moreover, that proto-sulphate of iron did not precipitate the whole of the silver from a neutral solution of nitrate of silver, which is not in accordance with hitherto received opinions. In order, therefore, to add to our knowledge concerning the actions which take place between silver and sulphate of peroxide of iron, I have made some experiments on the subject.

I steeped a sheet of silver in a boiling and very weak and neutral solution of persulphate of iron. The metal was immediately attacked, and was covered with a blackish layer. When the colorless solution of persulphate of iron was boiled with the silver, it acquired a yellowish color, which disappeared on cooling: I ascertained, however, that the silver is not the cause of this change of color, for when a dilute solution of persulphate of iron is boiled, without the addition of silver, it likewise assumes a reddish yellow tint which it retains so long as it is kept boiling, without any apparent change in the oxidation, and it again becomes colorless on cooling. The same phenomenon also presents itself with many metallic oxides, which, at a high temperature, affect other tints, without undergoing any perceptible change in their composition.

When the persulphate of iron had been kept boiling for a quarter of an hour, and the silver did not appear to diminish in bulk, I withdrew it, and steeped it in another solution of persulphate of iron, in which it entirely dissolved after a few minutes' boiling.

Potassa and ammonia formed in the solution a blackish brown precipitate. Hydrochloric acid occasioned a copious white precipitate, insoluble in nitric acid, which had all the appearance of chloride of silver. Ferrocyanuret of potassium, which did not effect any change in the solution of persulphate of iron before the silver had been steeped in it, produced in this solution, containing silver, a blue precipitate: whence it results that, by the boiling with silver, protoxide of iron had been formed.

The argentiferous liquid was evaporated to dryness, and the residue was dissolved in boiling water, from which, at the expiration of twenty-four hours, small crystals of sulphate of silver were deposited, accompanied by bracteæ of metallic silver. The solution separated from these crystals still contained silver and protoxide of iron, for hydrochloric acid formed in it a white precipitate, and ferrocyanuret of potassium, a blue one, and cyanuret of sulphur turned the liquor of a blood red: whence it follows that sulphate of silver may exist in a liquor with protosulphate and persulphate of iron, without being decomposed by the former.

None of these phenomena are observed when metallic silver is put in a boiling solution of protosulphate of iron; the silver is not attacked, nor does the liquor change colour.

As the persulphate of iron used in these experiments was the result of the action of nitric acid on green sulphate of iron, I feared that a small quantity of nitric acid might be left in, which would favor the oxidation and solution of the silver. To remove all doubt on this point, I dissolved some hydrated oxide of iron in sulphuric acid perfectly free from nitric acid, and I put in this solution, which was as neutral as possible, and boiling, a thin piece of silver: it likewise turned black, and disappeared after a short time.

Persulphate of iron formed by the calcination of green vitriol also dissolved silver

* *Journal de Pharmacie*, Dec., 1840.

by boiling. In general, when green vitriol contains only a very small quantity of persulphate of iron, it dissolves silver, part of which, on the cooling of the liquor, is reduced by the great excess of protosulphate of iron.

We have already seen that the concentrated solution of sulphate of iron and silver deposited crystals on cooling; these crystals, however, bore no resemblance to the double salt of oxide of iron and oxide of silver described by Lavini; this deposit is nothing more than a mixture of sulphate of silver, sub-sulphate of iron, and reduced silver. Moreover, I ascertained by the following experiment, that the silver is not dissolved in sufficient quantity to form a double salt:—

Half an ounce of well dried persulphate of iron was dissolved in two ounces of water. After putting a thin piece of silver, weighing 24 grains, into it, I boiled it for half an hour, and then removed the piece of silver, which still weighed 7·5 grains; only 16·5 grains, therefore, had been dissolved by the persulphate of iron,—too small a quantity for forming a double salt with the sulphate of iron.

That the white precipitate which sea-salt occasions in this ferruginous solution, arises from silver, is beyond doubt; but the precipitate has this peculiarity, that held in suspension in the liquid, and exposed for several hours to the solar rays, it does not perceptibly lose its whiteness. The solution of persulphate of iron, therefore, is a preservative of chloride of silver, and prevents it from being blackened by the sun. This may be seen to a certain extent when common salt is added to a solution of persulphate of iron, mixed with nitrate of silver; on exposing the mixture to the sun's action, the chloride of silver remains white longer than when no persulphate of iron is present.

A similar phenomenon was long since observed by M. Gay-Lussac, in nitrate of silver containing a little mercury, and precipitate by common salt; in this case the chloride of silver did not blacken in the sun.

It appears that the property of protecting chloride of silver from the action of the solar light, belongs only to the mercurial and ferruginous salts; for by adding common salt to solutions of sulphate of copper, sulphate of zinc, and sulphate of manganese, all of which were mixed with nitrate of silver, the white precipitate which resulted turned black on exposure to the sun, as quickly as without the addition of these different metallic salts.

If sulphate and acetate of iron protect chloride of silver from the action of the sun for some time, it is still more securely and remarkably effected by the use of a mecurial salt.

A sheet of silver is quickly attacked by corrosive sublimate dissolved in water; the metallic lustre of the silver immediately disappears, and a grey powder is formed; but on boiling the solution of corrosive sublimate, containing the silver, a white powder, which does not turn black in the sun, is formed. This powder, which is insoluble in water, becomes black on contact with ammonia, and chloride of silver may be separated from the ammoniacal solution, by means of nitric acid. The white powder is allowed to partially sublime in glass tubes: the unsublimable residue fuses at a higher temperature, and dissolves in ammonia; therefore it acts like a mixture of chloride of silver and chloride of mercury (calomel).

When corrosive sublimate, dissolved in water, is kept boiling for a sufficient time with an excess of silver, it is entirely decomposed into two insoluble chlorides of silver and mercury; but the decomposition goes no farther—calomel does not yield chlorine to silver.

From the above experiments it results:—

1. That silver is oxidised and dissolved in a solution of sulphate of peroxide of iron.

2. That in this case a double salt of the two oxides of silver and iron with sulphuric acid is not formed, but rather sulphate of silver, whose oxide is not reduced by the green sulphate of iron produced by this action.

3. That the sulphate of silver does not undergo any reduction when in solution, by the sulphate of protoxide of iron, accompanied by an appreciable quantity of persulphate of iron.

4. That chloride of silver held in suspension in a solution of sulphate of peroxide of iron, resists, for a long time, the action of the solar rays, without being blackened.

5. That corrosive sublimate, in its aqueous solution, is half decomposed by silver; that it yields one atom of chlorine to form chloride of silver, and is converted into protochloride of mercury or calomel.

INVESTIGATIONS CONCERNING THE SALTS OF LEAD FORMED BY HYPONITRIC AND NITROUS ACIDS.*

BY M. EUGENE PELIGOT.

Proust was the first who observed that lead is dissolved in considerable quantity when put in contact with a heated solution of nitrate of lead: the salt produced depo-

* *Académie des Sciences; Comptes Rendus*, No. 21, 11 Nov. 1840.

sits on cooling, in the form of shining yellow scales.

The conclusion which Proust drew from this fact was, that the oxide of lead is reduced to a degree of oxidation inferior to the protoxide; but Berzelius, in a work published in 1812, showed that the solution of lead is effected, not by the reduction of the oxide of lead, but at the expense of the nitric acid contained in the salt employed.

In an experiment made and published at the same period, M. Chevreul arrived at the same conclusion, and described two distinct salts formed by the action which different quantities of lead exert on the nitrate of lead; and, in a second memoir on this subject, he noticed the similarity of the analyses, and the differences in the properties presented by the salts, simultaneously studied by Berzelius and himself.

Being led, in the course of the investigations concerning nitrous and hyponitric acids which I have undertaken, to analyse Proust's salt, I obtained results, the interpretation of which does away with much that is at present admitted as to the nature of this body. Indeed, I think that I can demonstrate that there exist three very distinct compounds, formed by the action of lead on nitrate of lead: two of these combinations contain, not nitrous acid, as Berzelius and Chevreul affirm, but *hyponitric acid*; thus, the latter acid, which, according to Dulong's analyses, is formed of two volumes of nitrogen and four volumes of oxygen, would be capable, contrary to all received opinions, if not of directly combining with bases, at least of existing in combination with them, like nitric acid.

I have prepared Proust's salt by putting one equivalent of lead to one equivalent of nitrate of lead. It is best to put 63 of lead to 100 of nitrate. If 78 of lead be employed, as proposed by Berzelius, a mixture is obtained, as Chevreul observed, of yellow salt with the orange salt, which is afterwards formed. If, on the contrary, less than an equivalent of lead be employed, a mixture of bibasic nitrate of lead is obtained.

The action is kept up and terminated at from 60° to 70° C., without any disengagement of binoxide of nitrogen: this gas is produced only by the decomposition of the yellow salt produced.

When this salt is mixed with the orange-colored salt, it may be separated by treating the mixture with a quantity of warm water insufficient for wholly dissolving them, profiting by the much greater solubility of the orange salt.

The analyses of this salt consist in the direct determination of the oxide of lead, and of the nitrogen and water which it contains.

The results which I have obtained perfectly agree with the formula:—

$$N O^4, 2 Pb O, H O.$$

They agree equally well with the proportion of oxide of lead of Berzelius and Chevreul: but Berzelius, who has not ascertained the quantity of nitrogen, admits, hypothetically, and relying on the necessary existence of nitrous acid in this salt, that it should contain 6·4 of water per cent.: the experiment gives only 3·2.

Thus the very simple equation:—

$$N O^5, Pb O + Pb + H O = N O^4, 2 Pb O, HO,$$

accounts for the production of this salt, which, hitherto, was very obscure.

The second salt which is produced is of a orange red color: it is obtained by dissolving in the boiling solution of one equivalent of nitrate of lead, an equivalent and a half of lead; on cooling, a mixture of orange and salt is obtained; the latter is separated by means of boiling water, the former being less soluble.

The analyses of this salt coincide with the formula:—

$$N^2, O^6, 7 Pb O, 3 H O.$$

The composition of this salt is confirmed by synthesis; for by boiling bibasic hyponitrate of lead with oxide of lead, the same orange colored salt is obtained.

The prolonged ebullition of a solution of nitrate of lead with two, three, or more equivalents of lead, furnishes the rose-colored salt mentioned by Chevreul, the composition of which, according to his analyses, those of Berzelius, and mine, is represented by the formula:—

$$N O^3, 4 Pb O, H O.$$

The water contained in these salts is not disengaged except at a temperature exceeding 100° C.

It is only with the rose salt and carbonic acid that the neutral nitrate of lead can be prepared; the yellow liquor which contains it, evaporated *in vacuo*, yields yellow, elongated prisms. This salt is very different from that described by Berzelius, which he obtained necessarily mixed with nitrate of lead, since he used Proust's yellow salt to produce it.

As by the processes of direct analyses, the differences which exist between the results of calculation, and those of experiment relate to the oxygen combined with the nitrogen to form nitrous or hyponitrous acid; and as this determination of oxygen is the culminating point of the question, I have endeavoured to ascertain more directly the quantity of those elements, availing myself, in the first place, of the property which each of the three salts possesses of dissolving integrally in cold acetic acid, even when concentrated and in excess; and, in

the second place, of the action which peroxide of lead exerts on these salts thus dissolved. This action consists in yielding oxygen to the nitrous or hyponitric acid to convert it into nitric acid; nitrous acid dissolving one part more of peroxide of lead than the hyponitric acid, and this oxide presenting a very high atomic weight, the employment of peroxide of lead appeared to me to be calculated to give conclusive results as to the constitution of these salts.

The results which I have obtained by putting these bodies in contact, after taking their weight, and by determining the quantity of peroxide of lead dissolved by each of the acids, contained in these salts, fully confirm the formulæ which I have adopted for representing their several compositions.

CHEMICAL INVESTIGATIONS CONCERNING THE ESSENTIAL OILS.*

BY MM. C. GERHARDT AND A. CAHOURS.

Hitherto the essential oils have been the subject of but few investigations; some of them only have been submitted to a thorough investigation, and that is owing to the difficulties in purifying them. Indeed, but few have been obtained in the crystallized state: they are, for the most part, liquid, and constitute mixtures of two, and even three peculiar principles, which we are but rarely able to separate by distillation at different temperatures.

We have undertaken a series of investigations concerning this class of bodies, and we have been fortunate enough to find a very simple process of separating, in a state of purity, the heterogeneous two principles of which many essential oils are composed.

Many chemists have proved the fact that the essential oils, which are naturally produced in plants, and which are extracted from them by simple distillation, are mixtures, in variable proportions, of an oxygenous oil and of a hydrocarbon. Sometimes the oxygenous oil is crystallized, whilst the principle which accompanies it affects the liquid state; in this case the separation of the first easily succeeds; but it is not so with the hydrocarbon, which is always obtained mixed with a certain quantity of the other product. The distillatory process not being of a nature to remove these difficulties, it was necessary to find a chemical agent which, put in contact with an essential oil, should extract from it the oxygenous principle and permit the hydrocarbon to be disengaged without alteration. Now we have found potassa in fusion answer this purpose perfectly well.

The employment of potassa in fusion, has allowed of our ascertaining the presence of two peculiar principles in several essences, among which, those of cumin, valerian, and chamomile have chiefly engaged our attention. Each of these three essences contains an oxygenous oil, which potassa converts into an acid, and a hydrocarbon, on which that substance has no action. The hydrocarbon of the essence of valerian is converted into common camphor under the influence of nitric acid.

We now publish the results to which the study of the essence of cumin has led us; our investigations concerning the other two will form the subject of another Memoir.

The essential oil of cumin pre-exists in the seed of that name: it is not, like the essences of mustard and bitter almonds, the result of the action of water on certain principles which constitute the seed. To ascertain this fact, we treated the latter successively with water, anhydrous alcohol, and pyroxylic spirit, and these various modes of treatment have always yielded the same oil.

This oil contains two principles: the oxygenous one forms the basis of a series of very interesting combinations, greatly analogous to those which the study of the essential oil of bitter-almonds has lately made us acquainted with.

This body, whose composition is represented by

$$C^{40}\,H^{24}\,O^2 = 4 \text{ vol. of vapor},$$

yields, under the influence of the alkali and of most oxygenating bodies, a peculiar acid

$$C^{40}\,H^{24}\,O^4,$$

which may easily be obtained in the crystallized state. The preparation of this new acid is carried on with such rapidity, that a kilogramme may easily be produced in an hour.

Under the influence of chlorine and bromine, the oxygenous principle yields bodies derived by substitution of the same type:—

$C^{40}\,H^{22}\,Cl^2\,O^2$ and $C^{40}\,H^{22}\,Br^2\,O^2$.

These compounds are converted into the acid of which we have spoken, when they are subjected to the action of water.

Put in contact with potassium, the oxygenous principle of the essence of cumin disengages hydrogen and produces a combination

$$C^{40}\,H^{22}\,KO^2,$$

which may be assimilated to salicyluret of potassium. Water decomposes this compound into primitive oil and potassa.

The peculiar acid which results from the oxidation of the essence of cumin, gives, when submitted to the action of heat with an excess of base, a hydrocarbon

$$C^{36}\,H^{24} = 4 \text{ vol. of vapor},$$

which has some of the properties of Mits-

* *Comptes Rendus*, No. 22., Nov. 30, 1840.

cherlich's benzine. Thus it combines with sulphuric acid, producing a vinic acid, whose salts crystallize beautifully. The salt of baryta has the composition

$$C^{36}\,H^{22}\,S^{2}\,O^{5}\,Ba\,O.$$

Finally, the chief hydrocarbon found in essence of cumin, has the composition

$$C^{40}\,H^{28} = 4 \text{ vol. of vapor.}$$

It is likewise very analogous to benzine, for it combines, like it, with sulphuric acid, forming a new vinic acid. The composition of the salt of baryta obtained with it, is represented by

$$C^{40}\,H^{26}\,S^{2}\,O^{6}, BaO.$$

The two principles which constitute essence of cumin, the history of which we have just sketched, give rise, as is seen, to many remarkable transformations. Their products are distinguished by their clearness of form and composition.

EXAMINATION OF A NEW FAT ACID EXTRACTED FROM PALM OIL.*

BY M. FREMY.

The very curious observations on palm oil lately published by MM. Pelouze and Felix Boudet, should induce chemists attentively to study the solid fat acid which may be procured by saponification from this oil, and which may even be spontaneously formed in it, according to MM. Pelouze and F. Boudet's investigations.

The experiments which I now have the honour of communicating to the Academy have been completed for several months. It was my intention to have extended the observations which I have made on palm oil; but M. Liebig has prevented me by informing me that in his laboratory results identical with mine had been obtained. I have therefore thought it best immediately to publish a brief detail of my investigations.

I extracted from palm oil a solid fat acid which I purified by the common means, and which greatly resembles margaric acid.

It has the same point of fusion as margaric acid: it melts at 60° C.

It presented the following composition:—

1st			Hundredths. 1st	2nd	Atoms.	Theory.
M = 0·2605	M = 0·2345	C =	75·4	75·1	C^{64}	C = 75·37
Water = 0·295	Water = 0·264	H =	12·5	12·4	H^{128}	H = 12·40
A. c. = 0·711	A. c. = 638	O =	12·1	12·5	O^{8}	O = 12·23
			100·0	100·0		100·00

The acid of palm oil, heated to 250° C, crystallizes in alcohol in small and very hard crystals, while before it crystallized in beautiful plates.

I analysed the acid when thus modified: it had undergone no change of composition:—

		Hundredths.
M =	0·279	C = 75·20
Water =	0·314	H = 12·49
A. c. =	0·775	O = 12·31
		100·00

It is volatile without decomposition. The following is an analysis of the distilled acid:—

		Hundredths.
M =	0·256	C = 75·38
Water =	0·393	H = 12·70
A. c. =	0·698	O = 12·12

The capacity of saturation of the acid of palm oil was determined by analysing some salts of silver.

1st	2nd	3rd
Salt of Silver . . . 0·188	Salt of Silver . . . 0·168	Salt of Silver . . . 0·394
Oxide . . . . . 0·060	Oxide . . . . . 0·052	Oxide . . . . . 0·124
Acid . . . . . 0·128	Acid . . . . . 0·116	Acid . . . . . 0·270
Or 31·9 of oxide per cent.	Or 30·9 of oxide per cent.	Or 31·4 of oxide per cent.

4th	5th	6th
Salt of Silver . . . 0·319	Salt of Silver . . 0·2295	Salt of Silver . . . 0·338
Oxide . . . . . 0·100	Oxide . . . . . 0·0730	Oxide 0.107
Acid 0.219	Acid . . . . . 0·1365	Acid . . . . . 0·231
Or 31·3 of oxide per cent.	Or 31·8 of oxide per cent.	Or 31·6 of oxide per cent.

* *Academy of Sciences*, Paris: *Comptes Rendus*, No. 21, Nov. 23, 1840.

Representing the salt of silver by the following formula :—

$$C^{64}\ H^{124}\ O^{6} + 2\ Ag\ O,$$

theory gives 31·6 of oxide of silver per cent. This number does not differ much from those which I found.

I determined the composition of the anhydrous acid by analysing three salts of silver.

1st		2nd		3rd	
Salt =	0·3985	Salt =	0·424	Salt =	0·4275
Acid =	0·273	Acid =	0·291	Acid =	0·2880
Water =	0·309	Water =	0·331	Water =	0·3190
A. c. =	0·771	A. c. =	0·833	A. c. =	0·8130

Hundredths. 1st	2nd	3rd	Atoms.	Theory.
C = 78·08	78·19	78·05	C^{64}	C = 78·08
H = 12·55	12·62	12·29	H^{124}	H = 12·35
O = 9·37	9·19	9·66	O^{6}	O = 9·57
100·00	100·00	100·00		100·00

It is evident that the acid of palm oil may be considered as a bibasic acid. I have ascertained that it formed salts in which the acid was saturated by one atom of base and one atom of water.

I may give as an example the analysis of a salt of ammonia which is insoluble in cold water.

Salt of Ammonia	=	414
Water	=	475
Carbonic Acid	=	1·092
Hundredths	C =	72·93
	H =	12.70

By the ordinary processes I found that this salt contained 2·9 of nitrogen.

This analysis leads to the following formula :—

$$C^{64}\ H^{124}\ O^{6},\ N^{2}\ H^{8}\ O,\ H^{2}\ O.$$

Theory =		
	C =	72·9
	H =	12·4
	N =	2·7
	O =	12·0
		100·0

The acid of palm oil forms an ether which crystallizes very well, and which melts at a very low temperature. The following is its composition :—

		Hundredths. 1st	2nd Atoms.	Theory.
M	= 0·372	C = 76·1	76·6..C^{72}	C = 76·8
Water	= 0·406	H = 12·6	12·5..H^{144}	H = 12·4
Carbonic Acid	= 0·990	O = 11·3	10·9..O^{8}	O = 10·8
		100·0	100·0	100·0

This ether is therefore represented by the formula

$$C^{64}\ H^{124}\ O^{6},\ 2\ (C^{4}\ H^{10}\ O).$$

Finally, I examined the action of chlorine on the acid of palm oil, subjecting it to the influence of heat and light. I thus obtained a series of chloruretted acids, all of which seemed to possess the same capacity of saturation as the acid of palm oil. The chlorine entering into these combinations displaces an equivalent quantity of hydrogen. I passed a current of chlorine for nearly a month into the acid which I exposed to the influence of the solar radiation : I analysed the products. The last product analysed contained 60 per cent. of chlorine, and 3·9 per cent. of hydrogen. At this time the chlorine acted on the organic matter, but very slowly. The most stable compound, and that which is always obtained by passing a current of chlorine into the liquid acid, is that which is represented by the following formula :—

$$C^{64}\ H^{108}\ Cl^{16}\ O^{6}.$$

The first obtained chloruretted acids are liquid at the ordinary temperature, the last are hard and transparent like a resin.

I have ascertained that all the fat acids act in the same way, under the influence of chlorine.

The interest attaching to the study of these new compounds is well understood.

The different bodies of which I have spoken in this memoir, have been analysed by the ordinary process; I have not employed chlorate of potassa for terminating the combustion; I have used the old atomic weight of carbon in calculating my formulæ.

I have ascertained by direct experiments that the formulæ would not be altered by adopting the number 75 for the weight of the atom of carbon, and by passing into the tube, after combustion, a current of oxygen. I will resume this subject when M. Dumas's experiments on the atomic weight of carbon are published.

To conclude, MM. Pelouze and F. Boudet have analysed the solid acid of palm oil: the numbers which they found perfectly agree with those mentioned by me in this memoir.

ON CERTAIN PRODUCTS OF THE DECOMPOSITION OF OIL OF BITTER ALMONDS.*

BY M. N. ZININ, OF CASAN.

M. Zinin has observed, in the ordinary method of preparing benzoïn, namely, by dissolving oil of bitter almonds in lime water or baryta water, heating the solution in hot water, &c., that the aqueous solution of pure hydruret of benzoïle is most easily converted, by the addition of a little cyanuret of potassium, into quite pure white benzoïn. He then also tried treating oil of bitter almonds containing prussic acid, by a recent alcoholic solution of potassa, prepared with or without heat, but saturated; and he saw the liquor in a few minutes resolve itself into a solid, yellow, crystalline mass, which was benzoïn mixed with a small quantity of a resinous substance, formed by the reaction of the potassa on the alcohol. Pure benzoïn is obtained by crystallizing, several times, the alcoholic solution. The liquor from which the benzoïn is deposited, is strongly alkaline, and the weight of the benzoïn is almost equal to that of the oil of bitter almonds employed.

Pure hydruret of benzoïle, mixed with weak alcoholic solution of cyanuret of potassium, is quite as easily converted into almost colorless benzoïn. It is not the same with the cyanurets of mercury and zinc.

All the oils of bitter almonds do not furnish the same quantity of benzoïn, nor of the same degree of purity; that depends on the proportion of hydro-cyanic acid which they contain, and on their freshness.

M. Laurent has observed that dry benzoïn, when melted, is converted, by the action of dry chlorine gas, into benzile, with a disengagement of hydrochloric acid. Treated by nitric acid, benzoïn gives the same body. On dry benzoïn, we pour about double its weight of nitric acid, and a gentle heat is applied. There is a powerful disengagement of nitrous acid, and the benzoïn is fused: then a clear, yellow, oily substance rises to the surface. As soon as this liquid becomes completely transparent, the disengagement of nitrous acid ceases, and the operation is terminated. The oil which floats on the surface is pure benzile. It may be boiled with nitric acid without decomposition. Benzile is very soluble in ether. By the spontaneous evaporation of this solution, long transparent crystals may be obtained. They are hexahedral prisms.

If the oil of bitter almonds or hydruret of benzoïle be mixed with about ½ of its bulk of almost anhydrous hydrocyanic acid, and stirred, and added to an equal bulk of a concentrated solution of potassa diluted with six parts of alcohol, and stirred and gently heated, on the liquor being left to itself, after some time, a white, flaky, caseïform body is formed; it is the same as that produced in the preparation of benzoïn, when the oil of bitter almonds contains much hydrocyanic acid.

The liquor was decanted and the substance was boiled with water, in which it is entirely insoluble, and which completely removes from it the benzoïn and other foreign matters, and it was purified by solution in alcohol.

This body is under the form of a light flaky mass, of a white color, or slightly tinged with green; it is very little soluble in alcohol and ether; it dissolves in concentrated sulphuric acid, assuming a fine emerald green color, which afterwards turns to red; water precipitates this body from it without alteration; nitric acid dissolves and decomposes it. It is insoluble in hydrochloric acid and a solution of potassa. It bears a great resemblance, in appearance and chemical properties, to the substance described by M. Laurent, under the name of benzimide; but its analysis gives a very different composition. The composition of the new body may be expresed by the following formula:—

	Calculated.	Found.	
46 At. Carbon .	78·22	78·40	78·28
36 — Hydrogen	4·99	5·09	5·20
4 — Nitrogen	7·87	7·76	,,
4 — Oxygen	8·92	8·75	,,

Which explains the probable mode of its formation: indeed, 3 eq. of hydruret of benzoïle, with 2 eq. of hydrocyanic acid, minus 2 eq. of water, give the composition of this body.

* *Annalender Chemie. und Pharmacie.*

M. Zinin could not perceive any action of the hydrocyanic acid on the benzoïn; but if benzine be dissolved in boiling alcohol, and if a nearly equal weight of almost anhydrous hydrocyanic acid be added, on the liquor being allowed to settle, beautiful rhomboïdal tables of a brilliant white, and of a vitreous lustre, produced by the combination of a rhombo-octohedron with a right prism. They melt on the application of heat, and are decomposed, leaving a residue of benzile. They are not decomposed by boiling water, nor by concentrated boiling hydrochloric acid. Heated with ammonia, or with nitric acid, they also leave a residue of benzile. If the alcoholic solution of these crystals be mixed with an alcoholic solution of nitrate of silver, cyanuret of silver and benzile crystallizes out of the solution. If the alcoholic solution of this body be heated with deutoxide of mercury, that oxide is reduced, and the odor of benzoïc ether is very strongly perceptible. It is formed of

	Calculated.	Found.	
16 At. Carbon	72·93	72·948	72·983
12 — Hydrogen	4·46	4·576	4·577
2 — Nitrogen	10·55	10·390	,,
2 — Oxygen	12·06	,,	,,

Consequently, this body is formed by the combination of one eq. of benzile, with one eq. of hydrocyanic acid.

It might be named *cyanhydro-benzile.*

If an alcoholic solution of benzile, not too concentrated and quite warm, be mixed with liquid ammonia, a white precipitate in fine grains is formed, which, exposed for about ten hours to a heat of about 70° C., and then redissolved in alcohol, after being washed, gives crystals: these are tables, or white, long, thin, and flat needles, with a brilliant rainbow (irisé) lustre: they are nearly insoluble in water: the aqueous solutions of ammonia and potassa do not dissolve them; the alcoholic solutions of these two bodies and hydrochloric acid, dissolve them, and let them crystallise without alteration. The alcoholic solutions of nitrate of silver and acetate of lead cause no precipitate in the solution of this body. Its composition may be expressed as follows:—

	Calculated.	Found.	
42 At. Carbon .	85·51	85·49	85·61
30 — Hydrogen	4·95	5·12	5·24
2 — Nitrogen	4·69	4·85	4·44
2 — Oxygen.	4·85	,,	,,

There is formed at the same time as this body in the solution of benzile treated by ammonia, benzoate of oxide of ethyle, and probably another substance, more soluble in alcohol, which crystallizes in small needles, and which has not been farther studied. The simultaneous production of benzoïc ether explains the formation of the body described above.

COMPOSITION OF THE SUGAR OF GELATINE AND NITRO-SACCHARIC ACID.*

BY M. BOUSSINGAULT.

Two years ago I devoted myself to the study of the saccharine matter obtained by M. Braconnot, by treating glue with sulphuric acid. It may be recollected that the existence of the sugar of gelatine had been doubted by many chemists. By following M. Braconnot's directions, I obtained from it the two substances described by him—sugar and leucine; but after a few experiments made with the view of fixing the composition of these two bodies, I was obliged to interrupt my investigations.

Since then, other chemists have touched on this subject; the results which they have obtained agree in some respects with mine; in others they totally differ from them. As I have done all in my power to give accuracy to my analyses, I can but mention these differences; future experiments will show on which side the errors lie.

SUGAR OF GELATINE.

The properties of the sugar of gelatine are sufficiently described in M. Braconnot's work. Its composition, deduced from the analyses of products of different origin, is:—

	Found.	Calculated.	
Carbon . .	33·85	34·00	C^{32}
Hydrogen .	6·44	6·36	H^{36}
Nitrogen . .	20·00	20·05	N^{8}
Oxygen . .	39·71	39·59	O^{14}

By means of a few precautions mentioned in my memoirs, sugar of gelatine may easily be combined with oxide of silver. The combination is under the form of colorless crystals, it is not very soluble in cold water.

	Sugar combined.	Combination.
Carbon . .	37·67	13·66
Hydrogen .	6·12	1·21
Nitrogen . .	22·26	8·07
Silver . . .	——	63·95
Oxygen . .	33·95	12·31

A composition which leads to the following formula:—$C^{32}\ H^{30}\ N^{8}\ O^{11}\ (Ag\ O)^{4}$.

	Sugar combined.	Combination.
Carbon . .	37·65	13·33
Hydrogen .	5·86	2·08
Nitrogen . .	22·16	7·87
Silver . . .	——	64·50
Oxygen . .	34·43	12·22

The sugar of gelatine very readily combines with the oxides of copper and lead.

* *Comptes Rendus de l'Académie des Sciences;* No. 23,—23d Dec., 1840.

These two compounds are very soluble in water.

The cupreous compound is obtained in an azure blue, crystalline mass: its analysis fully confirms the formula drawn from the oxide of silver.

The compound with lead crystallizes in beautiful colorless needles: its solution is entirely decomposed by carbonic acid.

I have experienced some difficulties in obtaining this compound in uniform proportions. The proportion of oxide of lead has sometimes varied from 63½ to 64½. By sufficiently prolonged treatment, a salt containing 64·9 gr. of oxide may be obtained,—a quantity much too great for the formula adopted.

Sugar.			Combination.		
	Found.	Calculated.		Found.	Calculated.
C	37·55	37·55	C	13·29	13.68
H	5·90	5·96	H	2·04	2·13
N	22·20	22·16	N	7·58	8·07
O	34·27	34·43	O	11·99	12·54
			PbO	64·96	63·58

NITRO-SACCHARIC ACID.

This acid is prepared by dissolving the sugar of gelatine in dilute nitric acid. It is gently heated, and on cooling the solution crystallizes: no action is observable; it is really a simple solution of the sugar in the acid.

Nitro-saccharic acid has a very sour, and at the same time a very sweet taste.

I have analysed it in three states: crystallized, dried at 110° C., and in salts.

Dried at 110° C., nitrosaccharic acid contains:—

	Found.		Calculated.
C	18·1	C^{12}	18·2
H	4·2	H^{12}	4·0
N	21·2	N^{16}	21·5
O	56·5	O^{27}	56.3

Nitro-saccharate of silver very readily crystallizes. Many accidents which I met with in heating the nitro-saccharates of lead and copper made me take some precautions in decomposing the nitro-saccharate of silver. To my great surprise I very soon found that these precautions were completely useless. It burns without detonating. Its composition is:—

	Acid.	Salt.
Carbon	19·61	10·08
Hydrogen	3·63	1·86
Nitrogen	23·01	11·83
Oxygen	53·75	27·63
Silver	——	48·60

The atomic weight deduced from this composition, supposing an atom of base in the salt, is 1535·2. But the atomic quotients evidently indicate that nitro-saccharic acid is polybasic. These quotients are:—C. 8·0; H. 8¼; N. 4·0; O. 8¼, &c.; consequently nitro-saccharate of silver becomes—$C^{32}\ H^{34}\ N^{16}\ O^{33}\ (Ag\ O)^4$. Thus the acid dried at 110° loses four atoms of water, which are replaced by four atoms of oxide of silver.

It is sufficient to look at the formulæ contained in my Memoir, to be convinced that in nitro-saccharic acid, the nitric acid remains unmodified.

The nitro-saccharates may be represented as resulting from the union of nitric acid with the corresponding saccharate, or as the combination of the sugar of gelatine with a nitrate; indeed the nitro-saccharates may be obtained by treating the saccharates with nitric acid.

Uncombined sugar of gelatine	$C^{32}\ H^{36}\ N^8\ O^{16}$
Sugar in the salts	$C^{32}\ H^{30}\ N^8\ O^{15}$
Combination with silver	$C^{32}\ H^{30}\ N^8\ O^{11}\ (AgO)^4$
Cupreous combination	$C^{32}\ H^{30}\ N^8\ O^{11}\ (CuO)^4$
Combination with lead	$C^{32}\ H^{30}\ N^8\ O^{11}\ (PbO)^4$
Crystallized nitro-saccharic acid	$C^{32}\ H^{30}\ N^8\ O^{11}\ (N^2\ O^5)^4\ (H^2\ O)^9$
Acid dried at 110° C	$C^{32}\ H^{30}\ N^8\ O^{11}\ (N^2\ O^5)^4\ (H^2\ O)^3$
Acid in the salts	$C^{32}\ H^{30}\ N^8\ O^{11}\ (N^2\ O^5)^4\ (H^2\ O)^2$
Nitro-saccharate of silver	$C^{32}\ N^{30}\ N^8\ O^{11}\ (N^2\ O^5)^4\ (AgO)^4\ (H^2O)^4$
Nitro-saccharate of potassa	$C^{32}\ H^{30}\ N^8\ O^{11}\ (N^2\ O^5)^4\ (K\ O)^4\ (H^2\ O)^2$

ON HYDRATE OF PHOSPHORUS.*

BY R. F. MARCHAUD.

Pelouze was the first who considered the white crust which covers old phosphorus as a hydrate of phosphorus. H. Rose regards it simply as a modification in the state of aggregation. Mulder, again, thinks that it is a combination of oxide of phosphorus with phosphuretted hydrogen. He remarks that the white sticks of phosphorus acquire a red color in distilled aërated water, and he immediately obtained a similar white substance by directing phosphuretted hydrogen on to red oxide of phosphorus.

M. Marchaud, being desirous of resolving this question, strongly pressed a certain quantity of this white crust, between leaves of filtering paper, as M. Rose had done; then he put it in a porcelain capsule over sulphuric acid, under the pneumatic apparatus, and left it for several days *in vacuo*. The first

* *Journal für Praktische Chemie*; vol. xx.

night a faint light might be observed; but it very soon disappeared. When the air was allowed access to it, the mass inflamed as phosphorus would have done under the same circumstances.

A new quantity of white crust was also dried over sulphuric acid, but under a bell in which was no vacuum. M. Marchaud afterwards placed it, like M. Rose, in a long glass tube, previously weighed, hermetically sealed at the inferior extremity. He determined its quantity, and plunged it into hot water. There was a slight disengagement of humidity, very probably hygrometric, and the residue, *which was converted into ordinary phosphorus*, was weighed; the weight had diminished little or nothing.

In order to confirm M. Mulder's assertions, the author put some sticks of phosphorus, which had become white, into aërated water; he left them there for several weeks without observing any change of color; then he directed on them a current of oxygen, under water, without any perceptible effect. Like M. Mulder, he obtained the combination of oxide of phosphorus, and phosphuretted hydrogen, and he likewise found that it very much resembled the white crust; but the manner in which it is affected by heat appeared very different.

He thinks, therefore, that he may conclude from his experiments, that the white crust is only, as M. Rose first thought, phosphorus in another state of aggregation.

ON THE PROPERTY WHICH ANIMAL MATTERS POSSESS OF DECOMPOSING IODIC ACID AND ISOLATING ITS IODINE.*

BY MM. SIMON AND LANGONNÉ.

Having lately been called on to attend an inquest in a case of poisoning, as was supposed, by laudanum, and after an inhumation of six months, in our experiments our attention was attracted by the constant decomposition of the iodic acid, although we could not detect the presence of any of the substances mentioned by authors as possessing the property of decomposing it, and although we were convinced that the principles of opium did not exist in appreciable quantity in the substances submitted to us.

Being aware of the just importance which chemists attach to this reagent in the detection of a toxical agent so frequently criminally employed, and although we are not yet permitted to publish the report of our analyses (*dated* July 11, 1840), and the considerations which it is our intention to join to it, we hope that you will be kind enough to give insertion to some facts which we think not uninteresting to science.

After having filtered and concentrated the liquids arising from the stomach and small intestines, and from the boiling of the matters contained in them, we tried one portion with perchloride of iron, and another with a solution of iodic acid, in presence of a little starch. The first of these reagents gave a red color; the second, a beautiful blue.

Being thus led to suspect the presence of a preparation containing meconic acid and morphine in the liquor to be examined, we adopted Dr. Christison's process for their separation. By this process, we obtained two liquids, one of which should have contained morphia in solution, and in the state of acetate, and the other free meconic acid.

We then tried different reagents with each of them, and, to our astonishment, we found that both acted in the same manner. Thus, the blue coloring of starch, by means of iodic acid, occurred in the liquid, which ought to contain only meconic acid; and that in which only morphia should be found, was turned red by perchloride of iron, and not blue, as we expected.

Moreover, seeing the deficiency of several characters essential to the elements of opium, and in presence of these unusual phenomena, we were constrained to conclude that the substances which had produced them were other than meconic acid and morphia. Their nature remained to be determined.

As to the red coloration by the perchloride of iron, we attributed it to hydro-sulpho-cyanic acid, which possesses that property, and which is met with in the saliva, and probably in the gastric and pancreatic juices. The investigation of the cause of the decomposition was much longer:—

At first, desiring to ascertain whether it was not owing to some of the agents mentioned by authors, we found that our liquids detected the presence of only acetic acid and chlorine, and salts of ammonia and lime. Now, the latter substances, either separately or together, are not possessed of the property in question. Whence, then, came this deep blue coloration, which was re-produced particularly by the contact of iodic acid starch? From an animal matter from which we could not free our liquids by repeated filtrations, by boiling alcohol, nor by precipitation; a matter which is unknown to us in its essence, but whose action is irrecusable.

Indeed, one of us having by chance taken to the amphitheatre, a portion of stomach, and having boiled it, the liquor immediately colored a piece of starch immerged in one or two drops of iodic acid: recent urine gave the same result: saliva had disclosed

* Extract of a letter addressed to the editors of the *Journal de Pharmacie*.

the same power that all the products of the animal economy and many other azotous bodies possess, as we can demonstrate; a power which we have not seen noticed any where, and which, in our opinion, ought to cause iodic acid to be entirely rejected in medico-legal investigations relative to the presence of opium and its preparations, as every liquid extracted from the viscera, or vomited, produces the effects which we have observed.

ON THE NATIVE NITRATE OF SODA, FOUND IN SOUTH PERU.*

BY A. A. HAYES, ESQ., OF ROXBURY.

The existence of nitrate of soda in Peru has long been known, and the inhabitants of a most arid and desolate region have made it, by simple operations, an important article of commerce and manufacture.

This salt has claims of scientific interest quite equal to those of any mineral hitherto discovered. It indicates to us, who are accustomed to a humid climate, with heavy rain storms, a state of atmospheric dryness, as far removed from our experience as the singular products there deposited are from our own rocks and soils.

During the scientific tour of Mr. John H. Blake, of Boston, a great number of specimens, illustrating the forms and composition of this salt were collected, and I have been enabled to learn some facts from the chemical examination of them, but have to regret that the loss of Mr. Blake's journal has prevented our having a full account of their geological relations.

The nitrate of soda exists in large beds, a few feet below the saline soil, or forming that soil in various places, from Arica on the north and west, to the course of the river Loa on the south. The country is an elevated pampa, having the form of a shallow basin bounded by the coast cliffs on the west, by the higher pampas on the north, by sandstone hills on the east, and the ravines through which the river Loa falls into the sea on the south.

The elevation of the pampa of Tamarugal, in the province of Tarapasa, is nearly 3300 feet above the level of the Pacific.

The western border of coast presents granite, on which the pale flesh-coloured feldspar porphyry, peculiar to volcanic regions, reposes. This rock is doubtless trachyte, and its extent and volcanic character make it one of the most important of known rocks. Imbedded in the soil, and forming extensive tracts, are shells of the same species as those now existing in the ocean. A saline soil and other appearances denote that a long line of coast has been elevated from below the ocean's waters. In travelling north, Mr. Blake found that the pampas were broken by ravines through which the waters from the Cordilleras flow at times. A remarkable feature is disclosed by these ravines: a section always presents a higher level on the north than on the south side, so that each pampa presents a *steppe*, rising as we advance northward. The sandstone hills forming the eastern boundary are of moderate elevation; they contain beds of gypsum, and form the western barrier of another basin, the eastern bounds of which are the Cordilleras.

The pampa is mostly uninhabitable, but spots where water can be obtained, and parts of the ravines are cultivated. Nearly midway between the eastern and western limits of this pampa there exists a buried forest of large trees, mostly of the Algorabo species. The trees are inclined towards the southwest, and the wood is singularly well preserved. Specimens have the color and grain of old mahogany, but are brittle. The gaseous constituents of recent wood seem to have been lost, for although resinous, it burns without flame. From personal examination of the country, east of the sandstone elevations, Mr. Blake concludes that a lake of considerable extent once covered the space between these and the Cordilleras. Numerous volcanic rents now exist among the mountains, and it is probable that the saline matter produced by them was dissolved in the water, forming a lake at the base of the mountains. This lake subsequently broke its barriers, and prostrated a forest then growing where the saline matter is now found. I have carefully examined the earthy matter which is mixed with the nitrate of soda from different parts of the province of Tarapasa, and find that the larger part is composed of fragments of finely powdered shells, the color being unchanged. A brown marl forms the remainder, such as results from the washings of sandstone: these facts I consider as supporting the conclusion of Mr. Blake. The surface of the pampa is mostly sand, clay and saline matter. The latter is composed of sulphate of lime and soda, and nitrate of soda—some parts presents the nitrate of soda at the surface—at others, a few feet below. These salts have all the physical and chemical characters of salts produced by decomposition and separated by evaporation from solutions. The nitrate of soda is found in distinct strata, a thin layer of brown loam separating the parts; it is also found mixed with salt, and forming a small portion of the whole mass. The refining operations are rude and simple. The richest masses of the native salt are blasted or broken and divided into small portions; with these, copper kettles are in part filled, and water, or the mother water

* *Silliman's Journal.*

of former operations, is added and heat applied until a boiling and saturated solution is obtained. The solution is transferred to wooden coolers, where the nitrate of soda crystallises. The undissolved salt remaining in the kettles is thrown aside, fresh salt being used each time, although not one-half of the nitrate of soda is dissolved. The coolers are emptied after the crystals of nitrate have ceased to form; it is dried, packed in bags, and sent to the coast on mules. The wood used in the operations is transported from a distance on the backs of mules from the borders of the pampa. Of late, attention has been turned to using the altered wood of the buried forest, and some excavations promised a supply. Water is found by sinking wells in some places, below the saline soil. The subsistence of the workmen, drivers, and mules, is mostly drawn from Valparaiso. The quantity of nitrate of soda which exists in various bodies is immense, and in addition it is probable that the saline soil would afford a large supply.

Native nitrate of soda, in fractured masses, has a granular structure, arising from the aggregation of irregular rhombic crystals, varying from fine grained to coarse grained. It is brittle, but yields more easily in one direction, separating into angular parts, resembling loaf sugar closely, in some specimens. Color varies from snow-white to reddish brown and gray. Some specimens have a lemon yellow tint irregularly distributed; specific gravity, 2·290; taste nitrous, with a cooling impression; odor, peculiar, and when warmed resembling chloride of iodine dissolved in water.

Composition of average specimens is, nitrate of soda 64·98, sulphate of soda 3·00, chloride of sodium 28·69, iodic salts 0·63, shells and marl 2·60=99·90.

Mixed with this mineral, I have found nitrate of potash, sulphate of lime, chloride of sodium, iodate of potash or soda and chloriodate of magnesia, the latter imparting the bright yellow tint which some specimens show.

ON SOME VARIETIES OF PEAT.*

BY PROFESSOR JOHNSTON.

Professor Johnston exhibited some varieties of peat from the moss near Paisley, which he stated were illustrative of a transition from the comparatively fresh and vegetable matter to a substance resembling coal, but which he affirmed to be ulmic acid. The author stated, that the same substance might be obtained from peat by digesting it in ammonia, and afterwards precipitating the brown solution by an acid; while, on the other hand, caustic potash extracts another acid, which he proposed to term *humic acid*.

Dr. Playfair stated, that an elaborate set of experiments had been made in Liebig's laboratory last winter regarding the nature of humic or ulmic acid. But the results of these had not been at all satisfactory, for the acid varies in composition from whatever source it may be procured. Thus Malaguti, Spengel, Peligot, and Stein, state the proportion of carbon nearly 10 per cent. different from each other. Even the same acid changes in composition by keeping. The reason appears to be, that it is vegetable matter in a state of decay, so that it is not surprising that results so inconsistent should be obtained by different analysts. The secretions from diseased elms might probably be a definite ulmic acid, but there is no reason for concluding that this is the substance existing in peat. Liebig has shown that peat probably proceeds from the decomposition of woody fibre; and this is occasioned by the oxygen of the air. The compounds resulting from this action can always be expressed in atomic proportions; so that when we find that all the chemists who have examined humic acid have obtained different results, we may reasonably conclude that no definite compound exists. There could be no doubt of the accuracy of the analysis of Professor Johnston, but until the same acid was found in other peats and other substances, it would be dangerous to consider it as a definite body.

* From *The Athenæum*.

ON THE MINERALS IN THE NEIGHBOURHOOD OF GLASGOW.†

BY PROFESSOR THOMAS THOMSON.

The neighbourhood of Glasgow, including Leadhills, is not inferior to Cornwall in the richness of its mineral species. The mines of Leadhills began to be wrought during the reign of James IV., under the name of gold mines; and it is said by Boethius, that he extracted from them a considerable treasure. In the time of James V. Leadhills was a lead mine as at present, and is particularly described by Agricola in his celebrated work *De re metallica*. Besides galena, no fewer than nine species of lead ore occur at Leadhills. These are—

1. Sulphate of lead.
2. Carbonate of lead, analysed by Klaproth.
3. Cupreo-sulphate of lead, described by Mr. Sowerby.
4. Sulphato-carbonate of lead, analysed by Mr. Brooke in 1820.
5. Sulphato-tricarbonate of lead, ditto.

† *British Association*; From *The Athenæum*, No. 677.

6. Phosphate of lead, analysed by Dr. T. Thomson.
7. Cupreo-sulphato-carbonate of lead, analysed by Mr. Brooke in 1820.
8. Chromo-phosphate of lead, analysed by Dr. T. Thomson.
9. Vanadiate of lead, analysed by Dr. R. D. Thomson 1834.

Leadhills also affords fine specimens of blende or sulphuret of zinc, and also of silicate of zinc. The Kilpatrick hills, which bound the valley of the Clyde, from the Stockey-moor to Dumbarton, and also the corresponding but lower range on the south side of the valley, are composed of various trap rocks, among which amygdaloid is pretty common. This rock is so termed from its containing numerous almond-shaped cavities interspersed through it. These cavities are filled up by crystallised minerals, most of them zeolites. These are:

1. Stelite.
2. Thomsonite.
3. Natrolite.
4. Mesolite.
5. Scolezite.
6. Lomonite.
7. Chabazite.
8. Analcime.
9. Cluthalite.
10. Stilbite.
11. Heulandite.
12. Harmotome, or Cross stone.
13. Carbonate of magnesia, at Bishoptown.
14. Dihydrous peroxide of iron, at Gourock.
15. Sulphate of barytes.
16. Calcareous spar.
17. Fibrous sulphate of lime.
18. Arroganite.
19. Wollastonite.
20. Prasolite.
21. Fluor spar.
22. Trehnite.
23. Augite.
24. Amphibole.
25. Felspar.
26. Labradorite, one of the constituents of a variety of greenstone at Campsie Glen and at Gleniffer.
27. Mica.
28. Epidote.
29. Steatite.
30. Iron pyrites.
31. Carbonate of iron.
32. Grey ore of manganese.
33. Kilpatrick quarts.
34. Sulphuret of cadmium; rare, and lately discovered occurring along with Prehnite at Bishoptown. Single crystals are now selling at 10*l.* each.

II. CHEMICAL MANUFACTURES.

Elements of Electro-Metallurgy, or the Art of Working in Metals by the Galvanic fluid. Illustrated with Wood Cuts. By ALFRED SMEE. London: PALMER, Newgate Street; and LONGMAN & Co.

We have long been desirous of bringing before our readers the science of Electro-Metallurgy, and gladly avail ourselves of the opportunity afforded us by the receipt of Mr. Alfred Smee's work on this subject.

Electro-Metallurgy can boast of no great antiquity as a science, the year 1836 being that in which its first germs were developed in a paper by M. De La Rue. Jacobi, Spenser, Murray, and Mason, may be mentioned as having materially assisted in elucidating this subject. But what little information is contained in the writings of the authors above mentioned is so scattered, that the work now before us, giving, as it does, a connected view of the science, may in truth be considered as the only important contribution and complete exposition of the various and interesting topics embraced within its grasp.

In the first book, Mr. Smee commences with a brief but lucid exposition of Galvanism, and then proceeds to describe the most approved batteries, concluding with a general view of the one invented by himself, which has been employed by him in all the processes described in the present work. It were needless for us to enter, in this place, into any detailed account of this instrument, it being already sufficiently known to the scientific men of this country, and we believe wherever known, as generally approved.

Comparisons have, we know, frequently been made between this and other of the more approved batteries; those, however, who have done so, seem to have lost sight of an important item in all investigations of this nature. This will be sufficiently plain from the following extract, which, as evidencing a laudable impartiality on the author's part, we feel great pleasure in adducing, more especially as we most completely coincide with him.

"Professor Daniell's excellent invention being distinguished by its constancy; Mr. Grove's powerful battery, by its intensity; and my own, by the quantity of electricity developed, and by its simplicity. Neither of these can be regarded as a perfect galvanic battery, for each wants some of the properties of the others; it is to be hoped,

therefore, that every attention will be given to the further improvement of these valuable instruments, until the good properties of each are combined in one. Which of these is at present to be preferred, must depend upon the purpose for which it is required, and the choice must of course be left to the operator. For my own part it affords me much pleasure to see that the platinized silver battery has fully answered the expectations which I formed of it. By some it has been too much extolled, by others too much blamed. It has been the subject of experiments not appertaining to it, such as comparing its intense effects when quantity is its characteristic. Notwithstanding the misstatements on both sides, it has fully stood the test of time, and has been employed by the public in a manner which I had not even hoped." That this is no exaggeration may be inferred from the fact of his having received for it the Isis Gold Medal annually awarded by the Society of Arts.

The second book treats of the apparatus to be employed for the reduction of metals: of the substances capable of receiving the metallic deposit; of the laws which regulate such reduction, and of the reduction of the metals themselves.

As regards the deposit of metal, this may take place upon any conducting substance that is capable of acting the part of the negative metal in the arrangement. Those which can advantageously be employed to receive a deposit of any other metal, are those which are not at all, or only slightly acted upon by the particular fluid in which they are immersed. The laws which regulate such deposit appear to have been arrived at by Mr. Smee, who states them as follows:—

"Law 1.—The metals are invariably thrown down as black powder, when the current of electricity is so strong in relation to the strength of the solution, that hydrogen is violently evolved from the negative plate of the decomposition cell. The term violent may seem to require some explanation, for the metal will be thrown down as a spongy powder, even when but few bubbles are given off in the half minute.

"Law 2.—Every metal is thrown down in a crystalline state, when there is no evolution of gas at all from the negative plate, and no tendency to it. When I speak of no tendency to the evolution of hydrogen, I mean, that either electricity of a much greater tension must pass, or the solution must be rendered of more easy decomposition, before gas would be evolved. The crystals may be small or large according to circumstances to be noticed hereafter."

"Law 3.—To throw down the metals in the crystalline state, we must use a quantity of electricity just sufficient to cause the minutest quantity of gas to appear at the negative plate; in other words, the quantity of electricity passing should cause a great tendency to the evolution of the hydrogen, if it be not slightly apparent at the negative metal. To say that hydrogen should be given off slightly from the negative plate, may lead to error, unless duly qualified, for it is only meant that a few bubbles should adhere to the negative plate, after the action has been continued for some hours, for there should be no farther evolution of gas. In fact, the crystalline state is obtained in the greatest perfection, when hydrogen is just at the point of evolution, but yet none is really given off from the negative metal."

The third book is taken up with the subject of gilding, plating, &c., in the course of which we find much valuable and interesting information; but the fourth is that, the contents of which will most probably interest our readers. Here we find discussed the multiplication of coins and medals, the copying of seals, plaster casts, &c.; the multiplication of crosses, the making of dies from embossed surfaces, the manufacture of moulds from fruits, vegetable, &c., and on the application of Electro-Metallurgy to sculpture and other purposes.

These subjects are treated of in separate chapters, each and all of which are so fertile in illustrations, that we must refer those of our readers who desire an adequate knowledge of the many and vast purposes to which the science and art have become subservient in the hands of Mr. Smee, to the work itself, contenting ourselves only with here adducing some of the most important.

"There are three methods of taking the duplicate of a coin or medal. By the first, a primary cast or an intaglio is made in metal, directly by the galvanic precipitation; by the second, a metallic cast of the medal is first obtained, either in fusible or type metal; and by the third, we make the intaglio cast in some non-conducting substance, as white wax, sealing wax, &c.

"To take a primary cast at once from the medal or coin should not be attempted by inexperienced hands, and never by any one from an unique specimen, for fear of any mischance. The process, however, is simple and very valuable, when we desire a very perfect intaglio impression of any coin or medal. The object to be copied is to be coated on the side where we do not require action to take place, with glass varnish, or other non-conducting substance. A very fine wire is to be passed round the rim, and then it is ready to be placed in the metallic solution. The adhesion of the air to the metal is of considerable importance in this case, and the metal should not be allowed to remain a single instant in the

solution before the galvanic circuit is completed."

On the copying of seals our author remarks:—

"Now that seals are nearly valueless, there can be no harm in describing the process for copying them. This is very simple: we first give them the thinnest film of black lead, with a hard brush. If necessary, this may be aided by cautiously applying the most minute drop of spirits of wine, but it should be avoided if possible; for the wax being soluble in alcohol, the seal is liable to more or less injury. A fine metallic wire is now to be heated over a candle, and the hot end placed in contact with the rim of the seal, so that it may adhere. Care must be taken to apply a little plumbago round the point of insertion, so that it may be continuous with the wire. It is then ready to be placed in the solution. This part of the operation is in all respects similar to that required for the mouldings of coins.

"The largest seal, as the great seal of England, or the large seals of the bishops, may in this way with ease be copied, and the smaller are attended with no more difficulty. The operator must remember, that although he is at perfect liberty to copy the Chancellor's seal of the last reign, yet he would be liable to the utmost penalty of the law, if he were to carry on his scientific proceedings upon the great seal of Her Present Majesty."

ON THE APPLICATION OF ELECTRO-METALLURGY TO SCULPTURE AND OTHER PURPOSES.

We consider this chapter so truly interesting, that we have subjoined nearly the whole as written by Mr. Smee. He commences with a remark which, though it disgraces us, is nevertheless true.

"Unfortunately the British public have nearly ceased to patronize British sculpture, otherwise Electro-Metallurgy would be a valuable assistant to that art. The sculptor first makes his model in clay, from which he takes a cast in plaster, and this again serves as a mould, into which he pours his fused metal. This latter proceeding is attended with much trouble, and not unfrequently with great danger, from a risk of explosion. The metallic cast when made, is by no means perfect, as it requires much labour to finish it. The Electro-Metallurgist would obtain a far more perfect cast at once, by simply preparing his plaster, black leading it, and placing it in the solution of sulphate of copper. A wire in contact with the black lead must communicate with the zinc of the battery, whilst the sheet of copper to be dissolved should communicate with the silver.

"For very large designs, an inconveniently large vessel would be required; to obviate this difficulty, the mould, provided it be hollow, might have the separate pieces of which it is made, so joined together by wax or grease, that itself should form the vessel to contain the liquid. Very large batteries ought to be employed by the sculptor, and rather a dilute solution; because, in all probability, the size of the battery will not be proportionate to the immense surface exposed in even a moderate-sized design. The piece of copper, forming the positive plate, should be as large and as close to the plaster-mould as it can be placed, in order that as little impediment as possible may be afforded to the passage of the current.

"The copper may be of any thickness; and its strength and thickness may be regulated as required in different parts, by increasing or diminishing the distance between the plaster and the positive plate of copper. The relative cost of this method of making a bronze figure, over the plan now in use, is perhaps difficult to estimate accurately. By the old plan a bronze figure costs the value of the copper, and the coals required for its fusion, besides the labour requisite to render the metal cast perfect afterwards. By the galvanic method, it would cost the value of the copper + the value of an equal weight of amalgamated zinc + the cost of the labour required to work the batteries — the value of the sulphate of zinc formed.

"From the above statements a rough idea only can be formed of the relative cost of these two methods in practice, and it can only be determined with certainty by very large operations.

"Before bringing this work to a conclusion, I may mention that the application of electro-metallurgy, or the art of working in metals by the galvanic fluid, is not confined to the foregoing subjects; for every kind of object, which can possibly be made in copper by any other method, can also be made by electricity!"

Our limits alone prevent our taking special notice of the fifth and sixth books, the former of which takes up the subject of the electrotype, the latter that of galvanic etching. In these a vast field is open to the lovers of the fine arts, by the easy and almost indefinite multiplication of some of our finest copper-plate engravings, which, according to Mr. Smee, are not more difficult to copy than plain ones; a plate possessing the most elaborate design—the most brilliant conception—the most delicate workmanship—in fact, every thing calculated to render a plate valuable—may be copied with the same readiness—the same fidelity—the same ease—as the plate without any workmanship at all.

In bringing our remarks to a conclusion, we can only express our unqualified approbation of its contents, our admiration of the persevering and never-tiring industry of the author, our astonishment at the immensity of the facts he has accumulated, of the ingenuity he has throughout displayed in overcoming no ordinary difficulties, and of the pains-taking labour by which he has been enabled, not only to lay the foundation, but likewise to build the superstructure of a new science, whose application to the every-day business and comforts of life it is as impossible for us to predicate, as it would have been for our forefathers, a century ago, to have done with regard to the powers and applications of steam. Scientific pursuits, it is said, are incompatible with a just appreciation of the usages and customs of common life; and although we have doubts of the truth of this assertion, yet must we allow, that in the general appearance and manner, so to say, of getting up the work, many might find an illustration of its applicability. The gilt edges, the royal arms, the picture on the title-page, and the whole outside appearance of the work, put us more in mind of one of the gaudily dressed annuals, or of the ephemeral productions of nameless writers, depending more on external shew than on internal worth or intrinsic merit, than of a scientific treatise every way creditable to its author.

We presumed that Mr. Smee was not answerable for these defects, and consequently looked to the name of that publisher who could pursue so heterodox a course as that we are now reprobating. We find the highly respectable firm of Longman and Co. here standing second to that of E. Palmer, 103, Newgate Street; the former we must, we presume, acquit of all blame in the matter, and as regards the latter, we would with our wonted kindness attribute it rather to inexperience. If our memory do not deceive us, this is a very respectable instrument maker, who cannot consequently be expected to be quite so well versed in bookbinding as in instrument making or catalogue writing, a specimen of which is given (gratis we of course presume) as an appendix to Mr. Smee's valuable work.

Mr. Smee, we hope, will take these last remarks in the friendly spirit in which they are intended, and should he ere long, as we sincerely hope he will, again appear before the public, we would counsel him to alter, what, to himself, may possibly appear trivial points, yet which have great influence in prejudicing those into whose hands the book may fall.

ON THE SOLDERING OF THE METALS, AND ON THE DAMASKING OF GOLD AND SILVER.

BY M. J. FOURNET.

It is generally admitted in chemistry, that, of all the metals, iron and platinum alone possess the property of being soldered to themselves, without previous fusion. However, when we see two perfectly polished sheets of lead acquire, by simple pressure, such an adherence to each other, that, notwithstanding the imperfection of the contact, a weight of several pounds is required for their separation; and that after this disjunction, the surfaces present inequalities, it may be conceived that lead itself may be ranked among metals which are capable of being soldered, with this difference alone, that, instead of requiring a more or less elevated temperature, it possesses, under the ordinary circumstances, sufficient softness for soldering to take place.

This last consideration made me entertain the possibility of treating various metallic powders in such a manner as to bring them into a state of agglomeration, ductility and cohesion, without the aid of fusion. I excepted, however, the brittle metals, for the blow of the hammer and pressure destroy their aggregation, instead of increasing it. However, circumstances favourable to the cohesion of some of these might be found, since zinc, for instance, may be drawn out in the drawing plate, (*filière*,) at a temperature approaching that of boiling water, and which I once accidentally obtained with very pure and ductile bismuth by effecting the partial sulphuration of a mass of that metal: if, indeed, my memory do not deceive me, M. Chaudet arrived at the same result by another process.

It is evident that in these operations the interposition of powders, foreign to the metal to be soldered, must be avoided, because they would oppose the approach of its particles; the formation of oxides during the operation must also be avoided, for the same reason. Iron, for example, is soldered to itself, because it is capable of supporting, without being fused, a strong white heat, which allows of the fusion of the oxide, which the blows of the hammer cause to rise to the surfaces put in contact. Again, it is for the contrary reason, that the same iron, subjected to the action of the flatter (*laminoir*) and retaining a portion of its oxide in the interior of its pores, often present a mere bundle of layers, without intimate union, between which the microscope shows a greyish powder, which is nothing more

* *Comptes, Rendus*, December 28, 1841, *No.* 26.

than the interposed oxide, whose presence destroys the cohesion of the whole.

This being settled, I first operated on pulverulent silver, reduced from the chloride by means of sulphuric acid and zinc. This powder, heaped up in a crucible, was submitted to a simple roasting, which made its particles to approach so that they might bear very slight blows with the hammer. This first precaution being taken, I again heated it, and hammered it *de novo*, and so on, so that after a few operations, I obtained a perfectly tenacious ductile and homogeneous bar, which I manufactured into a vase, whose polish bore evidence of its perfect homogeneity. This mode of treatment is an exact repetition of that followed with regard to platinum.

I then tried gold, obtained in powder by means of "*inquartation*" and aqua fortis. The results were absolutely the same as with silver.

Copper should have acted in the same manner, if I could have opposed the formation of the oxide, and I tried the experiment on the metallic powder arising from the reduction of the peroxide, by means of a current of hydrogen. However, I experienced great difficulties, on account of the facility with which traces of oxide are formed, even when operating under carbon. The method which I found most successful is as follows:—

I make in the tube which serves for the reduction, a clot of scarcely the size of a hazel nut; I soak it in oil, and rapidly heat it to redness, by the blow-pipe, then I hammer it with great care; I again soak it in oil, and so on, until I obtain, after much loss, a small prism of ductile red copper, which I then can forge and laminate like gold and silver.

It is evident that oxide of nickel, which is reduced by the slightest contact of carbonaceous vapours, and which the flame of the blow-pipe instantaneously precipitates under the form of a metallic powder, even in the midst of borax, would act like the foregoing metals, and that it would be possible thus to obtain plates of this hitherto refractory metal.

Be it as it may, the easy success of my trials on gold and silver, made me think it possible to obtain a damask (*damassé*) of these two metals, which it is impossible to produce by fusion. For that purpose, I disposed in a crucible, alternate layers of the powders of silver and gold, and the operation succeeded to my desire, by following the same process as for the metals taken separately; but the imperfect method which I have thus described naturally is susceptible of many great improvements. For instance, by the assistance of the hydraulic press, a plate of silver powder might be formed sufficiently agglomerated to sustain itself. This plate might be cut by means of a punch, and the holes filled with gold powder, also agglomerated. A sort of inlaid work would be the result, which might be condensed by alternate roasting and hammering, until the mass acquired the metallic density and cohesion. In this preparation it would be very important to take into the account the contractility of the metals, otherwise there would be solutions of continuity, and cracks. However, we must not be frightened at a few slight cracks at first, for experience has shown me that they disappear under the effects of the hammer and molecular cohesion. It would be possible thus to obtain characters, devices, marbling, and, in fact, any designs whatever, of gold incrusted or damasked in a plate of silver, and *vice versâ*. Indeed, it would be possible to gild silver by this means.

The damask would be more susceptible of variation by polishing the surface of the gold and silver, or by deading the silver by means of nitric acid, or the gold by means of mercury. The results may be again modified, and colorations may be produced by mildewing (*nillant*) the silver; this operation has succeeded very well with me, by conducting hydro-sulphate of ammonia on to the surface of a plate of silver and by exposing the whole in a muffle to the degree of heat absolutely necessary for effecting the combination of the sulphur and the silver; after which it must be removed from the fire. The mass thus sulphurised is at first tarnished and black, but the laminating which permits the ductility of the sulphuret of silver, soon brings together some of the particles, so that its steel blue colour and its metallic lustre may be rendered evident.

It would also add that, in order to obtain agreeable effects, we must avoid the putting gold in too small masses into the silver, for in that case, it forms an alloy of the two metals, identical with English gold, which, on account of its paleness, is less adapted for the purpose.

For the same reason, the laminating should not be carried too far, otherwise the portions of gold and silver which are combined withdraw from contact and form an intermediate zone, the shade of which is not very agreeable. However, by taking the proper precautions, profit may be made of the property which these two metals possess of incorporating without fusion; for, by afterwards passing the damasked plates through the second water, a first series of dull zones or marbling of pure silver, may be obtained, then a second series of white or pale yellow veins, which, formed by the combination of gold and unattackable silver, remain polished; and in the middle glittering yellow bands of pure gold predominate.

For the rest, I shall be content if the indications here given are sufficient to put our artists in the way of further advances towards perfection, and if they think the discovery capable of some employment.

ON LIGHTING WITH COAL GAS.*

BY M. BLONDEAU DE CAROLLES.

In the midst of the continual progress which all branches of industry have lately made, that connected with gas lighting has remained stationary, and the gas works which now have to light the capital work on the same principles, and are constructed on the same basis as they were when this mode of lighting was first introduced into France.

Without here inquiring into the causes of this fact, it cannot, however, be admitted that this manufacture has attained to the last degree of perfection. The least examination is sufficient to show how many inconveniences the employment of gas is still liable to, which science ought to remove, encouraged, as it is, by the daily development of this new method of lighting.

In studying the subject of lighting by gas, it is by no means difficult to perceive that the decomposition of the coal is imperfect, the purification of the fluid inefficient, its measurement inaccurate, and the regulation of the flame bad. To improvements in these four essential parts of this branch of industry, I have directed my investigations.

The raising of pit coal has not increased in quantity since it has been used for the manufacture. It may even be said that at present it is less than in 1727, in which year Dr. Hales extracted from 158 grammes of Newcastle coal, 180 cubic inches of gas, (340 litres per kilogramme.) Now, only from 230 to 250 lit. per kilog. can be obtained.

One of the obstacles to the improvement of the processes of decomposing the coal arises from the opinion which has always been held, namely, that the quality of the gas diminishes at the same time as the quantity increases, so that such a compensation is established, that we should be content with the quantity obtained, without uselessly seeking to augment it.

This erroneous opinion is founded on a scientific datum:—it was thought that if at a low temperature the coal produced less gas, at least it was almost entirely converted into bi-carburetted hydrogen, a gas of great illuminating power, while at a high temperature, proto-carburetted hydrogen, which is formed in greater quantity, did not produce an amount of light equal to that obtained by means of bi-carburetted hydrogen. This explanation cannot be admitted, since it is known that gases owe their luminous power only to the presence of the volatile products which accompany them and saturate them, and communicate to them, whatever may be their nature, *a certain luminous power*.

According to that, it was necessary in the first place to ascertain the quantity of gas which a kilogramme of coal could produce, in order to discover the point at which to aim in manufacture, and then to determine the circumstances in which the coal should be placed, to be able to approach that limit.

After having demonstrated that a kilogramme of coal is capable of yielding 510 litres of good lighting gas, and that it generally produces but 250, I proved that it was attributable to the bad method of distilling now in use, and that, in order to approach to the number indicated by analysis, it was necessary that the coal should be disposed in thinner layers, and that it should be in immediate contact with the sides of the apparatus, so that its elements, under the action of a powerful heat, might combine under the form of a permanently elastic fluid, for which purpose it should be made to slowly pass through the length of heated surfaces, in order to effect the complete decomposition of the bituminous matters contained in it.

By putting these principles in practice I have been enabled to extract 380 litres of gas from a kilogramme of coal, that is to say, 130 more than in the common way.

The purification of the gas is as imperfect as the decomposition of the coal. Besides sulphuretted hydrogen, from which manufacturers do not always give themselves the trouble of freeing it, contains ammonia and sulphuret of carbon, which have never been removed from it. The lime used in the ordinary purification decomposes the hydrosulphate of ammonia, seizes the sulphuretted hydrogen, liberating the ammonia which mixes with the lighting gas, and communicates to it a disagreeable odour, while it diminishes its luminous power. It was necessary to remove this gas before it got into the gasometers; which I did by using coke covered with a layer of chloride of calcium, both of which substances have the property of absorbing ammonia.

The sulphur which coal contains, acting on carbon at a high temperature, produces sulphuret of carbon which may be rendered less volatile by putting it in contact with sulphur, which it dissolves. A layer of sulphur joined to one of coke, slightly impregnated with chloride of calcium, is sufficient to complete the purification, and to

* *Comptes Rendus, No. 26.* December 28, 1840.

prevent the gas from producing in burning, sulphurous gas, which, mixed with the steam, corrodes the coolers submitted to its action.

Having ascertained that all the instruments now in use for ascertaining the consumption of gas are liable to many causes of error, I sought a more accurate mode of measurement, availing myself of new principles. My process is based on the fact that lighting gas is saturated with steam at the temperature at which its combustion is effected, so that we may determine, by absorbing this steam by means of substances which have an affinity for water, such as lime, potassa, and chloride of calcium, by the increase of the weight of these matters, the quantity of gas consumed. In abandoning the measure of volume for the weight, the course adopted in chemistry will be followed, to which science the balance has rendered such great services in affording it more accuracy.

Finally I am enabled to regulate the emission of the gas by means of a very simple apparatus.

NEW APPLICATIONS OF THE GALVANO-PLASTIC PROCESSES.

LETTER FROM M. PERROT TO M. ARAGO.

I have just learned, through a journal, that M. Sorel has announced to the Academy of Sciences, that he has been enabled by means of a constant current, to fix, without heat, on iron, a more or less thick and very adherent layer of zinc, and that by this means he has been able to fix several metals on one another.

Consequently I thought it my duty immediately to send to the Institute, to be deposited there, some objects hastily collected, which remained from experiments, which I made more than a year ago, on metallic precipitations.

Among the objects contained in the box which I send, there are some experiments on a process of metallic incrustation, which I consider new, and capable of receiving many applications in the arts. I obtained these incrustations by means of galvanic currents, by precipitating a metal of one colour, in the parts corroded by a process analogous to that of engraving by nitric acid, on a metallic piece of another color.

Thus, as it was easy to foresee, the incrustations have all the perfection of the engraving, which serves as a mould, and the imperfection of the incrustation which I send you does not extend to that of the new galvanic methods which I wished to try in engraving.*

* *Comptus Rendus*, No. 26,—Dec. 28, 1841.

III. PHARMACY, &c.

ANTIMONY AND ITS COMPOUND.—PULVIS ANTIMONIALIS.

BY JOHN MACKAY, EDINBURGH.

It is well known that the Pulvis Antimonialis was introduced to our pharmacopœia as a substitute for Dr. James' Fever Powder, than which few medicines have been held in higher repute. Medical practitioners have not hesitated freely to employ this compound, and we have long had the anomalous circumstance of an empirical remedy being used in preference to the regular medicament of our colleges. There is no substance in the whole range of materia medica possessing so much singularity in historical relation as antimony, and it may not be uninteresting to briefly examine this metal and its preparation, the Pulv. Antimon. Comp.

The ore from which antimony was and still is obtained, received the name of Stebium from the ancients, hence the symbol S 6, still retained in chemical nomenclature. The first use of the metal is of ancient date, and as its name may testify, was noticed in a remarkable manner. Basil Valentine, a monk, in the belief that it fattened pigs, administered some to his brethren with the charitable intention of giving them a more plump appearance, but his experiment was attended with fatal results. It may appear singular to learn, that at the present time, the Sulphuret of Antimony given for the above purpose, should be employed in veterinary practice, for giving a smooth glossy surface to the skins of horses. The ancients considered large eyes a mark of great beauty, and accordingly we find the females, using the sulphuret for contracting the eyebrows, thus making the eyes look larger, a practice still resorted to by the Turkish ladies. At this time it was, however, considered poisonous in any form, a prejudice, which time, and improvement in chemical manufactures have done away with, and few preparations are now wielded with greater freedom or with more beneficial results than antimonials.

In the sixteenth century, while the controversy betwixt the Galenical and chemical sects was raging, and while one party denounced, and the other upheld, the prepara-

tions of antimony; the Council of Paris declared by edict, that antimony was totally unfit for internal administration; and Besnier was expelled the Faculty of Medicine in Paris in the beginning of the seventeenth century, for giving antimony to one of his patients. About thirty years afterwards antimonial wine was by authority publicly received into the number of purgatives, and in 1650, the former declaration was rescinded, and this metal brought into great estimation. In 1720, the disgraced medicine was prized so highly, that the same government, which had punished with such severity those who had dared to use it in practice, actually purchased the secret of the *Panacea Glauberiana*, since called *Kermes Mineral*.*

About the middle of the last century, Dr. James introduced his antimonial preparation by prescribing it for his own patients. He at this time gave it the name of *Fever Powder*, which it still retains. The notoriety which it soon gained, Dr. Ure thinks, arose as much from Dr. James's mode of treatment, as from the inherent specific virtues of his powder. At the commencement of the disease he evacuated the bowels by combining some mercurial with his powder, and followed this by giving very large doses of bark.† But although it is generally supposed that Dr. James was the original inventor of his nostrum, there appears to be considerable doubt on the subject. Dr. Paris attributes the discovery of the formula to an Italian of the name of Lisle, which is again contradicted by Dr. Halliday, of Moscow, who in a letter to Dr. Paris, on this preparation, claims the honor for a Mr. McIntosh. Be this as it may, we are certain that the activity of Dr. James's Powder depends upon the uniform quantity of protoxide of antimony found therein. The last two compounds of this metal, deutoxide and peroxide, are comparatively inert, particularly the latter, from its great insolubility in the animal and vegetable acids.

Before proceeding to examine the composition of the Pulv. Antimonial. let us glance at the mode of preparation. The ingredients generally employed are Sesquisulphuret Antimony and Hartshorn Shavings; they are to be deflagrated and afterwards exposed to a strong heat for some time.

The following diagram will perhaps give at one view, the change which the ingredients suffer:—

68 Sesquisulphuret Antimony { Antimony.....44 ; Sulphur.....24....24 Sulphur dissipated.

400 Hartshorn .... { Phosphate Lime..100 ; Gelatinous Matter 300....300 Gelatinous matter dissipated.

Then:—Antimony (as above) 44
Phosphate Lime (do.).....100
Atmospheric air yields oxygen .... 16 } ....160 Pulv. Antimonii Co.

Although the above is the mode generally employed, it differs from the formula lodged by Dr. James in chancery, a copy of which may be found in Dr. Ure's Dictionary, page 171. From the analysis of Mr. Phillips and Dr. Pearson, the quantity of oxide of antimony found in Dr. James's Powder was considerably greater than in the Pulv. Antimon. Co. while they have shewn the latter salt to vary, even when made by the same individuals at different times.

In preparing Antimonial Powder, the heat is not only great, but contiuued for some time: now this must necessarily be the means of producing indeterminate quantities of the protoxide and peroxide, in all probability dissipating portions of the former active compound, and adding a quantity of the latter useless preparation. Mr. Brande has found as much as five per cent. more of protoxide of antimony in one preparation than in another, both made in a similar manner, and seldom two samples giving uniform results. If, however, more attention were paid to the proper exhibition of the potassio-tartrate of Antimony I am inclined to think, that many of the indications of the James's Powder might be had, with a greater degree of certainty, than using the P. Antim. Co.

But to sum up, on this matter, there can be no doubt that there is some secret attached to the preparation of Dr. James's true powder, with which we are unacquainted, which is the more to be regretted, as the high, I may say exorbitant, price demanded for the genuine powder is a serious drawback to its general introduction, and placed within the reach of those only, whose purses can afford to pay sixpence a dose for a medicine weighing five or six grains, and which we have every reason for supposing does not cost the proprietor the *smallest divisible fraction of a farthing*. I have heard it stated that the late Dr. James received a large sum of money from government to communicate the *secret* mode of manufacture; whether this be true or not, we know, that *his heirs* are still enabled to prepare an *uniform salt*, for which we

* Vide *Dr. Paris's Pharmacologia*, page 77.

† Vide *Dr. Ure's Dictionary*, page 171.

have to pay them their own price. The simple fact of 100 grains pulv. antimonialis having been given without injurious results, sufficiently proves, that great difference exists betwixt this, and the true James's Powder.

THE STATE OF MERCURY IN UNGUENTUM HYDRARGYRI, PILULA HYDRARGYRI, &c.

BY CHARLES WATT.

Resumed from No. XIII.

In the further prosecution of our experiments detailed in the last number of The Chemist, we have ascertained to perfect satisfaction, that, of all the numerous articles for which the Pharmacopœia is indebted to chemical science, none are so little understood, or so much the subjects of culpable neglect, and nefarious deteriorations, as the common preparations of mercury, in the formation of which, during the course of our enquiries, we have discovered such infamous and heartless knavery as we hope and believe is totally unknown to the respectable portion of the profession.

We must, however, first proceed with our observations on the state of the mercury in these compounds, in which we have shown that oxidation is totally absent in the ointment, and very partially present in the blue pill: however, not wishing to remain satisfied with those experiments we had made from the samples procured from four of the most reputable establishments in London, we have obtained numerous others, and subjected them to a series of tests, from which we have derived the results which form the basis of our observations on the present occasion.

In procuring metallic mercury from the ointment, we were sometimes perplexed as to the means by which completely to free it from the oily matter, turpentine, &c.,* adhering to it; we therefore adopted the following method, which rendered our efforts completely successful. Having first melted the fatty matter with boiling water, and allowed it to stand till the greater part of it floated on the surface, we poured off the fluid fat, and then boiled the mercury in a dilute solution of soap until the metal collected in one globule. By this simple process we have procured the whole quantity that each scruple contained,† which, when weighed, and compared with the fat, proved that we had obtained the exact proportions of each component as directed by the Pharmacopœia. We now proceed to detail our observations upon this preparation as procured from various houses, both in town and in the provinces.

In many samples, we noticed *extreme lightness* in *weight*, and a *peculiar* and *transparent appearance;* on submitting them to the same processes, as we have described, we readily procured what little mercury they contained, and found it to vary from one to two or three drachms per ounce: we also found that the fat had been colored with indigo and Prussian blue, to give it the appearance of the genuine ointment.‡ We have carefully preserved these specimens, and noted the places whence they were procured, with the full intention, if called upon by any authority, to exert our utmost efforts to suppress such baseness. Let the parties BEWARE!

We now come to notice the results of our experiments on the Pilula Hydrargyri. We subjected this compound to the following processes:—

1st. We put one ounce of it, and four ounces of distilled water into a glass vessel, and applied heat by placing the vessel over a lamp, and allowing the mixture to boil for some time, when we added about two drachms of caustic potassa, in order to soften the vegetable matter in the conserve, without affecting the state of the mercury. We continued the heat until the conserve became quite pulpy, and then added fresh water to thin the liquid; the greater part of the mercury, in its metallic state subsided, accompanied by a small portion of oxide.

2nd. We boiled another sample, of equal weight, for about an hour in dilute sulphuric acid, and obtained precisely the same result as in the preceding case.

3rd. We boiled a third sample of like

* It is a well known fact, that turpentine, sulphuretted oil, &c., have long been in use to effect the union of the mercury with the unctuous matter, and these are the obstacles which we had to remove.

† Whoever repeats these experiments will be satisfied of the facts, and will, even with the naked eye, observe the minute metallic globules formed by the trituration. These, on slight agitation, will soon become one bright mass. The total want of oxidation readily accounts for the difficulty of incorporation, and the eagerness to resort to contrivances which act as intermedia, merely on mechanical principles.

‡ Little does it import whether this is the fraud of the master or of the apprentice; the one deserves the pillory, the other the *birch*. Surely such scamps will, ere long, be punishable by law.

weight in muriatic acid, diluted with an equal portion of water; and after this process was continued an hour, but slight traces of chloride of mercury were manifested on the application of chemical tests, and as in the preceding instances, the metallic mercury fell to the bottom of the vessel.

In all our investigations concerning the Hydrargyrum cum Cretâ, we obtained results analogous to those observed in the blue pill. To obtain the mercury, we had only to saturate the chalk with any dilute acid, which, with that substance, forms a soluble compound, and then well wash the precipitate with water. The mercury subsided to the bottom of the vessel as before, and principally in its metallic state, accompanied by a small portion of protoxide, showing, in the clearest manner, by the extreme smallness of its quantities, that this preparation cannot owe its medicinal properties to oxidation.

Any lengthened description of our experiments upon the state of mercury in the Black Lotion, would be a work of supererogation; it is sufficient to say, that this is the nearest approach to a true oxide. But our examinations have proved the correctness of M. Guibourt's observation that it also contains globules of metallic mercury, visible, on pressure, not only by a glass, but even by the naked eye.* In the deposit of the mercury, as obtained by the processes we have described in the medicinal preparations of that metal, the globules are distinctly visible even by unassisted vision.

It may here be inquired whether the mercury in fine division, or in oxidation is required in these predicaments. This question depends entirely on which of these forms medical practitioners intend should be employed; for our own part we contend, that both externally and internally, and particularly the latter, fine division is the better; but if oxidation is intended to be used, let the compound be prepared chemically, and thus at once put an end to the nefarious practices we have here related.

By the preceding experiments which we have now fully laid before our readers, we have clearly shewn that the actions of these preparations of mercury do not result from the oxidation of that metal. Thence it is evident, knowing, as we do, the effects which each of these compounds produces in animal bodies, that when in its metallic state its effects are precisely the same as when it is combined with oxygen, chlorine, or any other agent. This proves that the axiom commonly received in medicine, that metals do not act, either locally, or generally, on animal organs, unless combined with some other chemical agent, is totally fallacious. The reason why mercury is capable of acting thus is at once evident, viz., because it is a fluid and in minute particles; therefore it is absorbed into the system. All other metals being solids, it is quite clear, they can produce no action, either local or constitutional, and therefore must be reduced to some state rendering them susceptible of absorption. It has been remarked by writers that even arsenic in its metallic state, when introduced into the stomach, produces none of these direful effects which its acid or other combinations too soon evince.

It is a fact well worth serious consideration, that those preparations of mercury in which it is combined either with oxygen, chlorine, or any other body, act with most power locally, and are the slowest in producing the specific constitutional effects of that metal, and that such local actions are of a totally distinct character from those which it exerts on the system: while, on the contrary, those preparations in which it is in its metallic state, and finely comminuted, produce little or no local action, but are the most speedy and powerful in their general and constitutional operations.

We cannot close our observations on this important subject without a melancholy reflection on the little knowledge acquired by Physicians,* (nay, we might almost say their

* We are of opinion that in this case the mercury is not in the state of uniform suboxidation, as first noticed by Boerhaave, but that one part is oxidated, and another part metallic, and may be separated by agitation under water.

* Much more highly indeed would it advance the credit and reputation of general practitioners, if, instead of seeking to obtain a still further encroachment upon every other member of the profession, he would devote a portion of his *valuable time* to these and other investigations; then we might hope to see in this class a race of Boerhaaves, Harveys and Hunters taking the place in a grade incomparably below mediocrity; for indisputable is the fact, that among them there has not been one whose name is recorded as renowned for the slightest advancement of any one part of medical science, or of any of its collateral branches, even though he is Surgeon (mostly, it is true, without license), Physician, Midwife, Chemist, Toothdrawer, &c. Such attention to serve his profession would elevate him more than can any acts of the legislature, which would best protect the interests of society by compelling him to increase his stock of knowledge, or at once to

total ignorance) of the actions of metals in their various states and combinations, upon animal bodies: viz., what is their "modus operandi?" what set of organs each affects? what metals act locally, and what generally? and whether they enter into the circulation, and by what tests they can be detected? In the case of poisonous metallic substances, it appears clearly proved that their power is confined to local action on the stomach and intestines; for it is well known that the signs after death are those of increased vascular action and even ulceration. These compounds, unless in very small doses, do not appear to pass into the circulation.*

We would call the attention of medical men to a subject of such vital importance, and which involves considerations so eminently connected with the advancement of medical science and the benefit of mankind; but in the fear that they will not, it is our intention, in future numbers of this work, to communicate to our readers the results of our own experiments on the action of metals and their various combinations on different animals, having by frequent experience been brought to the undeviating conclusion, that whatever it is your wish to have done, your wisdom is best displayed in doing it YOURSELF.

REMARKS ON THE HOMŒOPATHIC DOCTRINE OF HAHNEMANN.

BY MR. YOUNG.

(*Concluded from p. 22.*)

Having in the last article endeavoured to prove that the action of medicine is not dynamic, and that when medicines are introduced into the system under peculiar circumstances and in very minute portions, they powerfully affect the vital principle, and produce symptoms unusually severe, as in the case quoted from *The Lancet*; and I would ask if it be not possible that any medicine may be so administered as to produce symptoms equally violent. Hahnemann thus describes the action of these attenuated doses.

"However feeble the dose of a remedy may be, provided it can in the slightest degree aggravate the state of the patient homœopathically; provided it has the power of exciting symptoms similar to those of the primitive disease, but rather more intense, it will, in preference, and almost exclusively, affect those parts of the organism that are already in a state of suffering, and which are strongly irritated and predisposed to receive any irritation analogous to their own. Thus an artificial disease, rather more intense, is substituted in the place of a natural one. The organism no longer suffers but from the former affection, which by reason of its nature and the minuteness of the dose by which it was produced, soon yields to the efforts of the vital force to restore the normal state, and thus leaves the body (if the disease be an acute one) free from suffering, that is to say, in a healthy condition.*"

If, therefore, it be possible to cure disease by means of minute doses of medicine homœopathically administered, without disturbing the secretions, weakening the system, or producing a disease, (which is sometimes more obstinate than the one under treatment,) but merely by an almost inappreciable quantity of a medicament, which gently, and almost imperceptibly arrests the progress of the disease, it surely does not require the eloquence of a Demosthenes to convince a man of ordinary capacity of the superiority of this mode of treatment.

But I am aware that argument is of no avail in such a case; a science like Homœopathy requires no comment; it is not by sophistry that truth is promulgated; let him who doubts try the experiment; let him give homœopathy a trial, and if he fairly tries the experiment according to the precepts of the illustrious German, and the result is not favorable to the sciences—then, and not until then, let him condemn it. I have seen, and therefore do I believe, and were I not convinced, my hand would not have traced these words,—I have seen the most violent paroxysms of pain (as in Tic Dolereux) vanish as it were by enchantment; malignant fevers arrested in their progress; and the slow, but unrelenting monster, Scrofula, subdued; and these effects produced, not by the violent and debilitating doses of the present race of healers, but by the almost infinitesimal doses of homœopathists; I have seen this, I say, and I believe.

The method of preparing the medicines

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merge him into his origin. The Chemist and Druggist's ledgers and day-books are not the companions of scientific research; from such quarters, therefore, hope is vain, and expectation only the sure precursor of disappointment. "*Ex nihilo, nihil fit.*"

* A series of experiments on the lower animals, in order to elucidate this subject, would bring to light many valuable facts well worth the trouble. Dr. John Rose Cormack, of Edinburgh, whose researches on the action of Creosote, variously tried on different animals, sufficiently show his industry and capability, has elicited some important results. We could wish to see the above subjects in hands so fitted for the purpose, and we should have no fear for the results.

* *Organon*, p. 296, cclxxx.

used in disease, recommended by Hahnemann, is as follows:—

"Of homœopathic medicines take one grain of those which are solid (mercury being included among the number, or one drop of those which are liquid); put this small quantity in about a third part of a hundred grains of pulverised sugar of milk, in an unglazed porcelain capsule; then mix the medicine and the sugar of milk together for a moment with a spatula of bone or horn, and pound the whole together during six minutes. The mass is then detached from the bottom of the capsule and pestle during four minutes, in order that it may be perfectly homogeneous, and then rubbed down afresh during six minutes, with equal force: collect the whole of the powder into a body during four minutes, then add the second third portion of the sugar of milk, and mix the whole, for an instant, with a spatula; then triturate with force during six minutes. This is to be once more scraped together during four minutes, and rubbed down again for six minutes, stir the whole together during four minutes, and add the last third portion of sugar of milk which is to be mixed by turning it about with a spatula; then triturate the mass powerfully during six minutes, scrape it together during four minutes, and the whole is to be finally rubbed down for six minutes. After the powder has been carefully detached from the capsule and pestle, put it into a phial, and let it be corked and labelled, with the name of the substance, and the mark, $\frac{1}{100}$, which shews that the substance is in the hundredth degree of attenuation. To carry the medicine to the ten-thousandth degree of attenuation, take one grain of the powder marked $\frac{1}{100}$ prepared as above, add the same to the third part of a hundred grains of pulverized sugar of milk, mix the whole in a capsule, and proceed in such manner, that after having triturated each third portion with force during six minutes, scrape the mass together during a space of four minutes. The powder when thus prepared, is put into well corked bottles, with the figures 10,000 marked upon the exterior, which will shew its degree of attenuation."*

Now the question is—does medicine by this trituration acquire any new or additional power? This, I apprehend, is to be known only by experiment, let any one who doubts it take the 1000th part of a grain of Belladonna for several days, observing at the same time the diet prescribed by Hahnemann, and if he is not convinced of the efficacy of trituration after a few doses, I will consent to forswear the art of Homœopathy.†

Let any one, who is habitually costive, take an homœpathic dose or two of opium, and he will find it produce a regular action of the bowels; or peradventure he may wish to experience the effect of a few doses of mercury, consisting of the 30,000th part of a grain of that metal, let the unbeliever do this; it will perhaps help his unbelief.

The only drawback to the success of this art is the almost universal hostility shewn to it by the members of the medical profession of this country. Homœopathy ought to have been cultivated by them, and rendered a means of alleviating the sufferings of their patients, and of rewarding their own endeavours, but they have unfortunately taken the same umbrage at the name of Homœopathy, as coach-proprietors did at the name of railroads, or the copyists at the sight of a printed book; and their very hostility ought to excite suspicion, the more so, as they do not pretend to controvert the science by actual experiment, but content themselves by calling the founder of it a Fool.

* This is the method of preparing the medicines used in chronic diseases, and is extracted from *Stratten's Notes to the Organon*.

† Homœpathic medicines may be procured at Mr. Headland's, Chemist, Clerkenwell.

DETECTION OF ARSENIC IN THE HUMAN BODY.‡

BY MM. KAEPPELIN AND KAMPMANN.

In order to remedy the inconvenience in the employment of Marsh's apparatus, caused by the loss of a portion of the arsenic of which it is endeavoured to detect the presence, and the presence of steam and air in the gas which is to be inflamed; and in order to remedy the difficulty of decomposing arseniuretted hydrogen, by means of heat, when it is desired to operate in a glass tube adapted to Marsh's apparatus, as Berzelius and Liebig recommend, MM. Kaeppelin and Kampmann have given the following disposition to it:—

A straight tube of 0m 01, fitted in a flask with two tubulures containing zinc; from the second tubulure is a bent tube communicating with a tube, in which is chloride of calcium, and to this tube another is adapted of 0m 005 in diameter, which is drawn out to a point at the free extremity. The latter tube passes into two holes bored in the middle of a sheet of copper; by this means the tube may be heated with a spirit-lamp for a length of about 5 centimetres.

When this apparatus is to be used, dilute hydrochloric acid is first poured on the zinc. When it is considered that all the air is ex-

‡ *Comptes Rendus*, No. 23, 7th Dec. 1840.

pelled the tube is heated to redness; the gas is inflamed at the drawn-out end of the tube, and the absence of arsenic in the agents employed may first be proved.

After this, pour into the flask, by means of the strait tube, 1st, fresh hydro-chloric acid; 2d, some liquid, supposed to contain arsenic; 3d, acid; and 4th, liquid supposed to contain arsenic; and so on.

If there be ever so little arsenic in it, it is collected in that part of the tube of 0m005 which has not been heated, and at the same time it may be proved that a portion of arseniuretted hydrogen has escaped decomposition, by enflaming the gas disengaged at the drawn-out end, and exposing a porcelain plate to the flame.

ON PRESCRIPTION WRITING.

To the Editors of the Chemist.

GENTLEMEN,—

I AM anxious to draw your attention, and that of others connected with medicine, to a subject which I deem of much importance, viz: the carelessness and ambiguity so frequently manifested in writing prescriptions, which, to say the least of it, is highly reprehensible; I am sure that you will concur with me, that prescriptions ought to be written with great ease and perspicuity, in order to prevent mistakes which might be attended with fatal consequences.

When we reflect on the vast and increasing number of youths engaged in dispensing medicine, it cannot be too strongly urged on the notice of the profession, to write as intelligibly as possible; and, I think, Gentlemen, if the nomenclature of the New Pharmacopœia were adopted, it would be more in accordance with the advancement of medical science, than adhering, as many do, to terms in use half a century ago.

In order to illustrate the necessity of writing prescriptions intelligibly, I may mention a circumstance which occurred to me the other day. A surgeon had ordered a cough mixture, in which were guttæ xviij of *Acid. Prussic.*, not stating the other portions of Mist. Camphoræ. and Aquæ, sufficiently plain for me to divine whether he intended it to be a ℥iv, ℥viij, or ℥xij mixture: it was so ambiguous that neither myself nor two medical men could satisfy ourselves—and I have met with many previous instances of a similar nature, and I dare say others can corroborate my statement.

If not too far intruding on your valuable space, I would advert to the actual necessity of the term "Acid. Hydrocianic. dil. P.L." being used on all occasions, in order to avoid Scheele's or other preparations being employed as formerly, and which, there is reason to believe, is even now not unfrequently made use of, although there is such a palpable difference in their relative strength as to incur great danger.

Apologizing for the length of this letter,

I am, Gentlemen,

Yours, respectfully,

Jan. 12, 1841. J. T.

SURPRISING RECOVERY FROM THE EFFECTS OF OPIUM.*

BY JAMES B. HARRISON, ESQ. SURGEON.

THE following instance of resuscitation must be allowed to possess much interest, both from the novelty of the method which was adopted to supply the natural movements of the chest, and the extraordinarily depressed state to which the patient was reduced. Though a considerable time has now elapsed since the occurrence of the event, it is impossible to review the circumstances of the case without a renewal of those feelings of astonishment which its happy termination was so well calculated to inspire.

As it is of importance, in cases of an extraordinary nature, that nothing be imputed to inaccuracy in the correct appreciation of facts, or to exaggeration in their details, it is always proper to increase, as far as possible, the testimony of individual experience. The subjoined statement is principally furnished from the notes of a gentleman, who has had many opportunities of witnessing instances of this kind, and to whose strict impartiality the most perfect reliance may be accorded.†

CASE. — Caroline Mercy, æt. 32, was brought into the Manchester Royal Infirmary on the 16th of June, 1839, at half-past three, P.M. On admission she was in a state of complete insensibility, so that it was impossible, either by pulling the hair, or pinching the skin, to excite any wincing, or signs of uneasiness; nor was any effect produced by the sudden affusion of cold water. The pupils were contracted in an extreme degree; and the countenance presented that peculiar vacancy, or want of definite expression, which is so characteristic of the influence of opium; the breathing was very considerably embarrassed; the inspirations and expirations being separated by an unusually long interval, and accompanied by slight rattles; the extremities were warm.

As soon as she was put to bed, Mr. Gaskell introduced the stomach-pump, with which he injected and withdrew about a gallon of cold water; but towards the end of the operation, as the breathing became laborious, the rattle louder, and the surface assumed a more livid appearance, he thought

* From *The Lancet.*

† Mr. Samuel Gaskell, the present superintendent of the County Asylum at Lancaster.

it prudent to desist. He accordingly introduced into the stomach about two ounces of the liq. ammoniæ, contained in about as many quarts of water, afterwards removing with the pump as much as could be conveniently withdrawn. Large sinapisms were then placed down the back, but she appeared, notwithstanding, to get gradually worse; the respiration became more difficult, the lividity greater, and the pulse less full, and slightly irregular. Boiling water was now applied to the feet and legs, which had the effect of increasing, for a time, both the power and frequency of the respirations, but the benefit was only of a very transitory kind.

At about a quarter-past four, Mr. Gaskell thought it desirable to assist the respiration by artificial means, and he accordingly proceeded to adopt the following expedient: He placed a large pitch plaster on the abdomen, and by this means maintaining his hold, endeavoured to solicit the usual respiratory movements. This did not, however, give him so much assistance as he had expected, and he was therefore induced to abandon it after a short trial. He then placed a similar plaster on each side of the thorax, by which he was able to command a more decisive effect: he thus, with the assistance of the man-nurse, alternately raised and depressed the ribs, in imitation of the customary actions. This plan was productive of some amendment; the lividity diminished, and the natural muscular efforts were more frequent and apparent; the assistance was adapted as carefully as possible to the indications of nature. In addition to these means, boiling water was occasionally applied to the arms and legs.

At about five o'clock I came to Mr. Gaskell's assistance. At this period the temperature of the body had become considerably reduced, and the conjunctiva had lost its injected character. I remember the patient's appearance was exactly that of a dying woman; and I believe it was the impression both of Mr. Gaskell and myself, that our patient could not survive long. The lips were of a livid colour; the expression of the countenance altogether cadaverous, and the rattle in the throat had become exceedingly loud. Boiling water poured on the legs did not now excite the slightest movement, so that, at this time we were almost disposed to desist from further efforts. The circumstance, however, that whilst our exertions lasted, they were evidently productive of advantage, never suffered us to abandon them for long together.

In pursuing these attempts to maintain the respirations by artificial means, we had finally laid aside the use of plaisters, having our hands placed on the margin of the chest, and our fingers curved round the cartilages of the ribs. Situated on each side of the bed with our faces turned towards the feet of the patient, we could thus easily enlarge the capacity of the thorax by approximating the ribs, at the same time that they were elevated. In expiration the reverse movement could be accomplished with equal facility. By a steady continuance of our exertions, we had the pleasure of seeing a gradual improvement in our patient, and towards six o'clock the pulse had acquired the hard jerk which is commonly felt when the system is under the influence of opium.

Shortly after six o'clock, indications of returning sensation were evinced by occasional spasmodic quiverings of the muscles of the chest and abdomen. These spasmodic movements resembled the actions which usually denote approaching dissolution, with this essential difference, however, that they became more frequent and prolonged at each time that they were renewed.

A little after seven o'clock she raised her eyelids, and, at the same time, her left arm was slightly elevated. By persisting in artificial respiration, and using means to rouse sensibility, such as forcibly striking the face and chest with a wet towel, and applying ammonia to the nostrils, in about half an hour from this period the state of stupor had, in a great measure, disappeared. Instead of lying prostrate on her back, she now lay on her side, and was enabled to breathe without assistance. We then caused her clothes to be put on, and the vesicated parts being dressed she was taken out of bed, and compelled to walk about the room.

It is worthy of remark, that whenever, from fatigue, we were led to suspend our efforts to maintain the respiration, a degree of relapse universally followed; the lips became more intensely livid, the pulsations of the heart more feeble and irregular, and the respirations fewer, and accompanied with a louder rattle. On again resuming operations, the converse was also noticed. When the amendment became decided, and the sensibility returned, the rattle disappeared altogether; and this took place without any mucous expectoration, notwithstanding it was natural to suppose that a considerable quantity of mucus was contained in the air passages. The subject was fortunately very favourable for our manipulations, as the abdominal coverings were sufficiently lax to admit the easy prehension of the chest. Of course the right hypochondriac region, from the situation of the liver, presented more difficulties to the operator on that side of the patient. As far as it could be done, we always waited for the natural indications of the act of inspiration, and paid great attention to regulate our movements in strict correspondence with each other. At the conclusion of our exertions, the cartilages of the ribs were slightly evert-

ed, and the cuticle removed in places by the unavoidable chafing of the hands.

June 17. It was found that she had been kept out of bed all night, which scarcely appeared necessary, and was, indeed, contrary to instruction. She had vomited through the night a light-brown coloured fluid, and complained of shooting pains in the head; the pupils were less contracted; the abdomen was painful and tender to the touch. She was directed to take linseed tea, and to have a poultice applied to the abdomen. The state of the pulse was not ascertained, owing to the vesicated condition of the arms.

18. The vomiting had abated, and the pain in the head was removed, though a feeling of lightness remained. The bowels were opened by half an ounce of castor-oil.

For several nights after this period she was troubled with a starting in her sleep, which, however, has been gradually removed by the administration of twenty drops of laudanum, given every night at bedtime. She also suffered much from the condition of her legs, which were severely scalded, especially on the posterior part, where they had been in contact with the hot water which had fallen on the bed; a superficial slough had formed on the dorsum of the left foot. On taking a full inspiration, she complained of some pain at the sides of her chest, where a degree of ecchymosis was discovered; a slight eruption, also, showed itself on the back, where the mustard poultices had been applied. The legs were healed after some difficulty; and, on the 27th of August, she was discharged cured.

The moral history of the case may, in itself, possess some interest; it is briefly as follows:—Her husband, who is a master-plumber, failed about four years ago, since which time he had lived irregularly; a circumstance which caused her to be much distressed and dejected in spirits. About two years ago she left her husband, and went to live with her mother, with whom she resided until the last two months; she then returned to her husband, who had promised an amendment, which, it seems, he did not keep. She again became low spirited, pawned her clothes, and was ashamed to go to her mother.

On Sunday, the 16th of June, she sat down to dinner at one o'clock, when, after a quarrel, she left the house and purchased sixpennyworth of laudanum, at four different shops. She says she obtained about a dessert-spoonful for a penny, and drank it as she purchased it. She then went to a neighbour's house, and can only recollect feeling heavy, and that she had brandy given her. She is of feeble frame, and was in delicate health at the time of her admission.

In conclusion, I may observe, that I have witnessed the employment of the foregoing method of resuscitation in other cases of suspended animation; and even in those which terminated unsuccessfully, it is probable that it accomplished all that could be effected by any contrivance for the purpose. Yet it may be thought premature, without further experience, to pronounce as to its relative advantages. In the mean time, it may, perhaps, be allowed, that by the mechanical expansion of the chest, we procure a more perfect and equable dilatation of the lungs than could otherwise be obtained; and that the ingress of cold air is thereby rendered more gradual, whilst it is less forcible and local in its operation. The action of the respiratory muscles may, moreover, by manipulations of this kind, be more effectually roused from a dormant condition. It must not, also, be overlooked, in estimating the advantages of this plan, that it calls for no lengthened preparation, and does not require the smallest aid from mechanical contrivances, which, however ingenious and valuable they may be, are not always at hand when they are most necessary to be used.

But whatever may be thought of the peculiar merits or demerits of the means resorted to for the restoration of the patient, the case may, at least, be considered useful, in showing us the importance of persevering efforts in the resuscitation of those cases where we have reason to suppose that asphyxia is only attributable to a loss of sensation. It is manifest that where the action of the heart is also destroyed, such attempts would be as unavailing as they would be unscientific; and it is to be regretted that the action of many of the narcotic poisons is of a twofold nature. "But, although the chief agency of these poisons (the narcotic) is on the sensorium," says a valuable writer,* "yet it is to be observed, that they all appear more or less to weaken, and often may irretrievably depress, the action of the heart likewise, and not merely by reason of their effect on respiration. And although there is one case on record where the fatal effect of opium on the human body was arrested by artificial respiration, after the natural had failed, yet, in general, the pulse becomes so feeble, the skin so cold, and the vital actions in the capillary vessels are evidently so much impaired, and under the influence of large doses of opium, before the respiration comes to a stand, that there is little ground for expecting that their fatal effect can often be arrested, even by this means, at so late a period."

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* Vide Alison's Outlines of Pathology, p. 342.

ON THE PREPARATION OF THE PROTIODIDE OF IRON.*

BY T. AND H. SMITH, CHEMISTS, EDINBURGH.

The protiotide of iron has not yet come into that general use which its efficacy, as a medicinal agent, merits, a circumstance probably arising from the great difficulty of obtaining it in a pure state. We have procured specimens of this compound from various sources, and, except in one instance, invariably found that, when dissolved, they yielded a solution of the periodide, with the separation of a large quantity of peroxide of iron.

The protiodide of iron has its elements united by so weak an affinity, and the iron has so strong an avidity for oxygen, that, unless very great care is used in preparing it, to regulate the temperature, and avoid exposure to the atmosphere, part of the iron passes into the state of periodide, free iodine is given off, and another portion of the iron absorbs oxygen from the air, becoming peroxide of iron, which is left undissolved on putting the preparation into water. These changes take place even at common temperatures, unless the iodide is carefully kept from contact with the atmosphere. In order to obtain a real protiodide, we would recommend the adoption of the following method as one which we have found uniformly succesaful:—

Having, in the usual way, prepared a solution of the protiodide of iron, boil it down in a glass flask, without removing the excess of iron, till the weight of the liquid is reduced to three or four times that of the iodine used. Then filter quickly into a shallow evaporating vessel, or common saucer, which, having placed in a flat cast-iron evaporating basin, surround with an excess of lime,† (the proportion being about a pound and a half for every four ounces of the solution,) placing it so that when it slakes and swells up it cannot fall into the dish containing the iodide. The iron vessel must then be carefully covered with a flat metal plate, and placed on a pretty hot part of the top of a table furnace. When the iodide becomes black and obtains a pretty thick consistence, its state is examined occasionally by dipping into it the point of a spatula. When the water is nearly expelled, the iodide, as it cools, concretes on the point of the spatula into a solid, which is soft and slightly moist in consequence of the presence of a small quantity of water. When in this state it ought to be removed from the furnace, after being swept with a spatula, so as to remove any scum of decomposed iodide from the surface, and the basin, with the cover remaining in its place, wrapped up in several folds of a thick dry woollen cloth or linen towel, so as to retain the heat as long as possible, and allow the iodide to cool very slowly. On cooling it will be found in the form of a black, brittle opaque, and crystalline mass, with a shining fracture. The iodide thus obtained is quite soluble in water, and produces a solution of a pale green colour. As soon as the iodide has cooled it must be broken into small pieces, and rapidly put into very small and carefully stoppered bottles not containing more than one or two drachms each, which must be kept in as cool and dark a place as possible. When the iodide is prepared in a close vessel with lime, as gentle heat is not sufficient to render it anhydrous, from its having such a strong attraction for water, it may be kept for days under these circumstances, and still remain moist, but if pretty sharply heated, and removed before the water is quite expelled in the manner recommended, it may easily be obtained in an anhydrous state without danger of decomposition, except at the extreme edge of the cake of iodide; this part ought therefore to be rejected. We have found that the protiodide of iron cannot be deprived of water by lime *in vacuo* at common temperatures, as under these conditions, the iodide seems to have a much stronger affinity for water than the lime. We have kept the solution *in vacuo* for more than a week, along with a very great excess of lime, without obtaining it dry,—the solution loses water up to a certain point, and then remains wholly unchanged.

* *Edinburgh Monthly Journal of Medical Science, No.* 1. January.

† We some time ago communicated to Dr. Christison our use of lime in the preparation of the protiodide of iron, and are happy to observe that this distinguished professor adopts it in the last edition of the Edinburgh Pharmacopolis.

MEMOIR ON SUSPENSION.*

BY M. ORFILA.

At the sitting of the Academy of Medicine, Paris, held on the 6th of October, 1840, M. Orfila read a long Memoir on Suspension. He discussed, successively, all the signs which had been given for distinguishing between suspension during life and after death. The characteristic which lately had been most insisted on, was the presence of zoospermes in the urethral canal, but this sign is by no means infallible, for it may be met with under all circumstances, and when death has taken place from other causes

* *Journal des Connaissances Medicales.* Nov. 1840.

than suspension. The congestion, which is remarked in the genital organs is quite mechanical, is not more constant. It has often been wanting in individuals who have hung themselves.

The conclusions of M. Orfila's Memoir are as follows:—

1. No sign indicated by authors as serving to distinguish strangulation during life, from that after death, has of itself sufficient value.

2. When there exists neither ecchymosis, rupture, luxation, nor fractures of the vertebræ, and when there are, on the contrary, traces of asphyxia, it is probable that suspension occurred during life.

3. The probabilities will be greater if ecchymosis be met with in the sub-cutaneous cellular tissue following the course of the cord, a character not produced on the dead body.

4. If some of the ligaments were torn, and if some of the cartilages of the anterior region of the neck were broken, suspension after death should be concluded on.

5. If fractures of the cervical vertebræ be discovered, we may be certain that the suspension was the result of a homicide.

6. If there were a luxation of the first cervical vertebra on the second, it might be affirmed that death occurred before suspension, that is to say, that the anatomical lesion resulted from violence foreign to the suspension.

M. Dumeril related a fact which he witnessed in 1812, at the *Maison Royale de Santé*, to which he was then physician. He had not long quitted the bedside of a patient when he was told that he was hanging by the rope of his bed. The most prompt assistance was immediately rendered, but without avail. A *post mortem* examination made next day showed a luxation of the first cervical vertebra on the second, pushed so far that the spinal marrow had been penetrated by the odontoid apophysis, and, however, the individual had always touched his bed with his bent knees, and did not seem to have made any effort to kill himself.

It is known that the executioners of Lyons and that of Paris, before the invention of the guillotine, differed in their modes of operation: the one killed by dislocating the first vertebra on the second, whilst the other strangled by asphyxia. It may here also be called to mind that nothing is more easy than luxations of the second cervical vertebra, especially during life. An Italian proverb also calls to mind the nature of the accident which sometimes occurs through the violent motion of sneezing, and which makes those present to say "*Dio ti salva.*"

POWER OF GALVANISM IN CASES OF SUSPENDED ANIMATION.

Mr. W. H. Halse, a correspondent of the *Dispatch*, gives the following description of some curious experiments on the power of galvanism, in cases of suspended animation. Mr. H. thinks if the galvanic battery were used in the manner he described, it would frequently be found successful.

"On Thursday last one of my spaniels whelped, having a litter of thirteen, six of which I took for my experiments. I drowned three of them in cold water, and kept them immersed for fifteen minutes, at which time I took them from the bucket and placed them in front of a good fire. No motion could be perceived in either of them. I then put the front legs of one of them in a jar containing a warm solution of salt and water, and its hind legs in a similar jar, in each of which was inserted one pole of the galvanic battery; the whole were then placed near the fire. The position of the dog being now favourable for operating on, without the necessity of making any incisions in the flesh, I passed a very strong shock through its body; it moved its hind legs. I gave it another shock, which caused its tail also to move. I now passed twenty shocks in quick succession through its body; it moved every limb, its mouth opened, and I was inclined to believe that the dog had actually come to life; but the moment I ceased passing the shocks the dog was as motionless as it was previous to my commencement. Again I continued the shocks, and I noticed that there was more motion in the limbs. Considering, that in proportion to the return of the sensibility, that these shocks would be too powerful for it, I decreased the intensity of them, and passed many hundreds in rapid succession, I continued this for about five minutes, the motion of the limbs increasing as the shocks increased in number. I now ceased; the dog still moved. It was restored to life. I placed it on a warm flannel in front of the fire, and in a very short time it appeared as well as it was previously to its being drowned; it crawled on the flannel, and made the noise peculiar to young dogs.

I now examined the other two dogs which were drowned and taken from the water at the same time that this one was. They were both dead — a plain proof that it was entirely owing to the galvanic fluid that life was restored.

The other three dogs I drowned in warm water, and kept them immersed for forty minutes, at which time all motion had ceased. Two of them I laid in front of the fire, and the remaining one I placed in the jars, as in the preceding experiment.

I now passed a few shocks of weak inten-

sity through the body, but no motion was perceptible. I therefore increased the intensity of them considerably, and gave the shocks in quick succession. Every limb moved, the belly protruded and again collapsed, and the head was raised. At this period I stopped passing the shocks, in order to see if there was any motion in the dog, when not under the galvanic influence; there was none. I again proceeded with the shocks, and having noticed that the limbs moved more rapidly than before, I considered it necessary to decrease the intensity and increase the quantity of electric fluid, which I did, so much as to be just enabled to perceive a slight tremour in the dog. I continued in this manner for about five minutes, at which time I removed it from the jars and placed it on the table. It was alive. In a quarter of an hour it appeared to be perfectly recovered.

The other two dogs (which were not allowed to get cold during the whole of the experiment) were now examined; no motion whatever could be perceived. I tried the effect of galvanism on one of these. I was successful. In one hour after this I operated on the other dog also, but it was in vain. There was no vigour remaining in the vital powers; life had fled.

TREATMENT IN CASES OF, AND EXPERIMENTS ON, POISONING BY ARSENIOUS ACID.

BY M. ORFILA.

At the sitting of the Academy of Medicine, Paris, held on the 20th of October, 1840, M. Orfila read a Memoir on the treatment in cases of poisoning by arsenious acid. He had tried fifty-seven experiments on dogs, with the view of proving the inefficacy of tonic and excitant treatment, and the good effects of diuretics.

Ligature of the œsophagus in dogs is perfectly supported for thirty-six hours, and thus prevents vomiting. Therefore it is possible to study the action of tonics, such as wine, quinquina, and brandy. M. Orfila says that by preventing vomiting after the administration of arsenious acid and tonics, all the animals perished, whilst all have survived when tonics were not administered, and when the ligature of the œsophagus not practised.

The analysed urines have always furnished a great proportion of arsenious acid after poisoning; for this reason M. Orfila considers the administration of diuretics one of the best antidotal measures.

MM. Gerdy and Londe wished that the quantity of arsenious acid swallowed could be exactly appreciated, as well as of that rendered by the urine and by vomiting, and of that exhaled by cutaneous transpiration. They added that, in medico-legal investigations, the viscera, which contain less arsenic than all the other parts of the human body, alone should be acted on.

M. Pelletier reminded the Academy that his father and M. Vanquelin had established the presence of arsenic in all the phosphates.

M. Chevallier thought that the presence of arsenic in our system might be attributed to the use of tinned vessels. Is it not more probable that it is owing to preparing the corn to be sown with arsenious acid, extensively carried on in some parts of France? A single farmer uses several kilogrammes of it per annum.

M. Orfila requested that a committee might be formed from the three sections of Forensic Medicine, Pharmacy and Chemistry, to assist at experiments which he was about to perform in the great amphitheatre of the *Ecole de Médecine*. His request was complied with.*

POISONING WITH ANTIMONY.†

BY DR. LOHMEIER.

Dr. Lohmeier of Schönebeck has related some interesting cases of poisoning with antimony which occurred to workmen employed in the manufactory of antimonial preparations. They were exposed, in their operations, to the vapours of oxide of antimony, antimonious and antimonic acids, and hydrochlorate of antimony.

The symptoms were, slight pain of the head, with tightness of the chest, gradually increasing to pain, and severe stitches, and accompanied with a dry racking cough. To these symptoms succeeded swelling of the cervical glands; burning and lancinating pains at the back of the neck and head; scanty expectoration, accompanied with sibilous râles; nocturnal sweats, and diminished appetite. Diarrhœa, with griping pains, and enlargement of the abdomen, came on, and subsequently stranguary, pains of the testicles, with loss of desire, proceeding to actual impotence, and ultimately shrinking of the penis, and atrophy of the testicles. The symptoms, after disappearing under treatment, broke out afresh, on the individuals being again exposed to the antimonial vapours.

Dr. Lohmeier recommends local bleed-

* We shall give a full detail of these experiments in our next number.—Eds. Chem.

† *Casper's (Wochenschrift*, April and May, 1840,) *and Edinburgh Monthly Medical Journal.*

ings, and the administration of bark, for the treatment, and strong currents of air through the manufactories, for the prevention of the injurious effects to which the workmen are exposed.

NOTICES OF NEW WORKS.

Edinburgh Monthly Journal of Medical Science. Edited by JOHN ROSE CORMACK, M.D. Edin. Edinburgh: Maclachlan, Stewart & Co.; London: Whittaker & Co. No. I. January, 1841.

IT has long been matter of surprise to us, that in Edinburgh, the seat of a justly celebrated school of medicine—a school from which many of our most eminent practitioners have emanated, there should be no journal of the nature of the one before us. The deficiency, however, is now most amply supplied.

Under the heading of "Original Communications," (the first of the four parts, into which the work is divided), are given several very interesting articles, among which we may mention,—"Surgical Cases and Observations," by James Syme, Esq., F.R.S.E. "On the Pathology of Laryngismus Stridulus," by Dr. Henderson; and "Contributions to Forensic Medicine," by Dr. John Reid.

The second part is devoted to reviews.

The "Periscope" which constitutes the third division, contains articles from various sources, British and Foreign, on subjects connected with anatomy, the practice of physic, pathology, surgery, midwifery, materia medicæ, chemistry, and forensic medicine.

The fourth gives the latest medical news, and in this division it is in future intended to give reports of the transactions of the various scientific societies.

The work is conducted on a most excellent system, and we wish it that success to which the talents of the editor and of the eminent contributors, whose names adorn it, entitle it.

To those whose professional duties engross much of their time, this work will be very valuable, as it will supply a great variety of articles in a very condensed, yet succinct form. As a proof of the great variety displayed in this journal, the number before us contains no fewer than forty-four articles on the different subjects above mentioned.

It is a very valuable addition to the medical periodical literature of the day.

The Student's and Dispenser's Manual; being an Explanation of the principal terms used in the Materia Medica; A Collection of words used in the Medical and Surgical Professions; Tables of Incompatibles, Poisons, &c. &c.; *A Table of Vegetable Substances of the British Materia Medica,* &c. &c. By G. WHITMORE. London, 1840.

THIS Manual will be found of great utility alike to the young and to the experienced medical practitioner. It contains all that is absolutely required in such a work, fully bearing out the announcement in the title; and it has the advantage of being so small that it may be conveniently carried in the pocket. The table of incompatibles alone would render it advantageous to the prescriber.

We feel somewhat surprised at what appears to us the high price of this work, as compared with its bulk; but we think its utility makes up for the magnitude of the charge. We recommend it to our brethren, none of whom should be without it.

MEDICAL REFORM, AS RELATES TO DRUGGISTS.

To the Editors of the Chemist.

GENTLEMEN,—

Chemists and Druggists generally, and I doubt not most of the respectable members of the medical profession would be glad to have a Medical Reform Bill based on the entire division you recommend in your comments on the bill proposed by Mr. Hawes, and no difficulty would, I think, exist, so far as it regards themselves; but there appears an almost insurmountable one for the public. There are many villages, at least eight or ten miles from any druggists' shop, although probably but a mile or two from a surgeon's. Now, in case medicine should be immediately required in one of these villages, after getting the prescription from the surgeon, two or three hours must elapse before it could be procured, or if it were a poor person without a horse, double or treble that time, which in an urgent case would be a serious inconvenience; and when not an appearance of immediate danger, it would probably, in many instances, prevent till a more convenient time, any application for medical advice. That in other respects it would be a public benefit, I am fully convinced, for certainly, druggists generally are much more particular in dispensing than surgeons, many of whom keeping no assistant, and not being disposed, or not being able, from their constant absence, to superintend the dispensing of their own medicines, it is

left to their apprentices, and not unfrequently to their servants,* to give pills out of such a pot, or even perhaps to put up a mixture.

I cannot conclude without expressing my thanks for the repeated calls you have made upon us to look out for ourselves, and I doubt not, if you can remove the main difficulty in the plan you recommend, petitions for its adoption will flow in.

I am,
Gentlemen,
Yours, respectfully,
A. B.

Colchester, Dec. 8, 1840.

PRESENCE OF ALUM IN BREAD.†

Several families having simultaneously been taken ill, on the fifteenth of last November, in one of the quarters of Paris, Dr. Lefebvre, who was called in to several of these persons, discovered that the cause of the symptoms which they experienced, arose from the bread they made use of. Indeed, analysis detected in it a certain quantity of sulphate of alumina and potassa. This salt has the property of rendering bread more white, and gives it an appearance of freshness which is agreeable to the eye. It also renders the bread more porous, and permits the paste to absorb more water—an evident benefit to the baker. M. Lefebvre has noticed the fact: it is for the authorities to watch over the manufacture of this commodity.

ANTI-HYSTERIC DRAUGHT OF DR. JOSAT.‡

Fifty-five observations, in my own practice, or in that of some of my brethren, enable me to indicate the following solution as being indisputably efficacious in every simple hysterical fit:—

R. Cyanuret of Potassium	gram. 0·05
Distilled Lettuce Water	. . 60·00
Syrup of Orange Flowers	. 20 00

It is administered by teaspoonfuls at intervals of ten minutes, if the fit be not yet manifested, and it almost always is prevented. In the contrary case, however intense the fit may be, it is stopped, or at least, greatly allayed by acting as above. I would observe, that care must be taken to employ the cubic cyanuret of potassium, and not the ferro-cyanuret. Experiment has shown me that the latter is utterly inefficacious.

* And often their wives and children.—Eds. Chem.

† *Journal des Connaissances Medicales.*

‡ *L'Esculape.*

ADULTERATION OF BUTTER.

It has come to our knowledge that various frauds are now carried on in this article to an enormous extent. The practice is thus contrived:—

Butter is sent over from Ireland, mixed, full one half, with bad flour, oatmeal, and pea flour, with a large quantity of salt and water, and is sold in London, Liverpool, Glasgow and Edinburgh, &c. &c. &c.; and thus the public, and especially the poor, are defrauded. The trick is concocted between the Irish factors and our dealers. The samples we have seen are sad evidences of human depravity. We are alive to the scheme, and shall send any samples we may get, when tested, to the source whence are to be expected the remedy of the nuisance and the punishment of the wretches of such baseness.—Editors.

TO CORRESPONDENTS.

Nota Bene.—*All Communications and Books for Review must be addressed, "To the Editors of The Chemist, care of Mr Hastings, Publisher, 13, Carey-street, Lincoln's Inn Fields, London." Communications must be pre-paid, and sent before the 15th of each month; Books for Review, before the 10th.*

Mr. Alfred Watts's communication does not contain much that is new or useful: we cannot devote *six* columns to it. Next month we may extract anything of sufficient importance.

A Subscriber must inform us what "substance of grease" he means, and he must be altogether more explicit.

A Subscriber, Hull.—One part of mercury and three parts of silver will form a very good amalgam for filling decayed teeth.

We could not decypher the name of the gentleman to whom Mr. A. J. Miles requested us to address. If Mr. M. will favor us with a second letter, it shall have an immediate answer.

If Medicus will enable us to address a letter to him, we will tell him how the information he requires may be obtained: space will not admit of our doing it here.

Answered by Post.—Mr. Arthur Trevelyan, and Mr. J. Mac Swinney.

Communications received from R. G. B.; N.; A. C.; Z.; S. P.; J. N.; R. M.; Mr. Brown, and M.D.

All the numbers of The Chemist are to be had of the Publisher.

A Reader in the Far West is informed that Leeches may be obtained at Potter's, 66, Farringdon Market, at the following prices:—Speckled leeches 1*l.* 2*s.*; Green 13*s.* per 100.

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THE CHEMIST.

I. CHEMISTRY.

INVESTIGATIONS CONCERNING THE TRUE ATOMIC WEIGHT OF CARBON.*

BY MM. DUMAS AND STASS.

When bodies are combined, and when one body is displaced by another, certain numerical relations are observed, which form the basis of modern chemistry. The existence of these relations, recognised by Wenzel, and generalised by Richter, served as a foundation to Dalton's atomic theory, and it has received considerable development from Berzelius's works. The well-known accuracy of the illustrious Swedish chemist might almost induce us to believe that these relations were determined in a manner more than sufficient for the wants and progress of science, at least, so far as regards the most common and most important ones.

We shall show, however, that there exists an error of about two per cent. in the determination of the quantity of carbon which expresses the proportion in which that body combines with other bodies in nature. This error—one of the most serious, it is to be hoped, that have to be corrected in the tables admitted by chemists—leaves no doubt as to the necessity of carefully revising all the other numbers relative to simple bodies. If these numbers were accurate, as is supposed, the error in that of carbon would long since have been detected; for it would have been made manifest, not only in every-day analysis, but especially in those which Berzelius has recently and with so much care performed, and from which he concluded that the present number for carbon must be retained.

In fact, the question may be reduced to the most simple form, for it consists in asking if, in the production of carbonic acid, for example, oxygen and carbon combine in the proportion of 800 of oxygen to 306 of carbon, as Berzelius says; or in the proportion of 800 to 300, as indicated by us.

Nothing, apparently, is easier to resolve than such a problem. Still, when one reflects on all the consequences which flow from it, one hesitates, in spite of oneself, from a fear of having omitted some precaution; one distrusts one's apparatus and products; and that is the reason why, in an experiment which seems so simple, before publishing a work which has occupied several months, we were obliged to repeat it so often and under so many forms, that certainly nothing similar was ever done in a determination of this kind.

But these precautions will not seem useless, when we reflect that many formulæ in organic chemistry will be greatly modified by this single alteration.

If a chemist found in an analysis, that 100 parts of any substance yielded 3614 parts of carbonic acid, he would conclude, if he adopted M. Berzelius's numbers, that the substance analysed was pure carbon. Now, this substance would contain at least 1¼ per cent. of oxygen, hydrogen, or some other body. This error has necessarily been committed in the analyses of anthracite and pit-coal recently published.

In an analysis like that of cholesterine, if 85 of carbon, 12 of hydrogen, and 3 of oxygen be found by calculating according to Berzelius, only 83 of carbon would now be found. Now, if one is not impressed with the importance of a change which reduces the quantity of carbon from 85 to 83, which makes a modification of a fiftieth, it is easy to conceive how serious this change is, when we see that all that is taken from the carbon must be added to the oxygen, which increases the oxygen from 3 to about 4·5—a change which amounts to half of the weight of that important element.

Thus, a body looked upon as free from

* *Académie Royale des Sciences;* Sitting of Dec. 21, 1840. From *Comptes Rendus*, No. 25.

oxygen, would contain it; in another, the proportion of oxygen would be doubled, or at least increased to such an extent that the admitted formula would be completely altered.

It is by this diminution of carbon and increase of oxygen, that we may explain why the analysis of fatty bodies, so carefully performed by M. Chevreul, generally remain accurate, although their formulæ should, in certain cases, be changed.

Certain organic alkalis, several volatile oils, many resins, and some neutral animal matters, will experience analogous changes, founded on the same reasons. We will publish in other memoirs the results which we have arrived at concerning these different points, if, however, we be not anticipated.

What stops us at present, is the fear of replacing erroneous formulæ by uncertain ones. Nothing can be more fatal to the real progress of organic chemistry.

As the Academy has often been occupied with the phenomena of substitutions, it will learn with pleasure that it was the study of those phenomena which led us to discover and to prove the error in question. The formulæ deduced for certain bodies from the old weight of carbon by Berzelius did not agree with the laws of substitution. It was evident that either these laws, or the weight of carbon, must be wrong. The question being once put thus, it became our duty to seek all means of resolving it, and we have neglected nothing which could render the solution faultless.

Indeed, when we submitted to analysis certain bodies which are very rich in carbon,—as the liquid or solid hydro-carbons on which we endeavoured to found the study of the phenomena of substitutions,—circumstances of a strange nature presented themselves.

Every one knows that what is called the analysis of an organic substance consists, as MM. Gay-Lussac and Thenard have shown, in its total combustion, that is to say, its conversion into water and carbonic acid. The operator therefore knows, by his own experience, the weight of the matter which he studies, and the weight of water or carbonic acid which it yields. From these latter he deduces the carbon and the hydrogen, relying on the composition of the water and of the carbonic acid itself.

Now, when the sum of the carbon and of the hydrogen, which these bodies contain, is made, it is found, going by the analysis of water and carbonic acid given by Berzelius, that this sum greatly exceeds that of the matter itself. Thus, 100 parts of naphthaline yield 95·5 of carbon, and 6·1 of hydrogen, making in all, 101·6. 100 parts of benzine would be formed of 93·5 of carbon, and 7·7 of hydrogen, making a total of 101·2.

Such results were absurd, but an explanation of them might be sought:—1st, in the method of analysis, which might have been incorrect: 2nd, in the analysis of the water, which might have been inaccurate: 3rd, in that of the carbonic acid, which might have been the same.

At all events, it was impossible to place any confidence in the analysis of such bodies, or of their derivatives, such serious deviations being capable of disturbing all the formulæ.

In a report made to the Academy in the name of a committee, charged with examining a Memoir relative to the oils of resin, which MM. Pelletier and Walter had submitted to it, one of us proposed to consider these deviations as owing to an error in the determination of the elements of carbonic acid: this opinion was perfectly correct.

Indeed, if we wished to attribute the excess of weight given by analysis to the method of performing that analysis, we have only to make it by other means, to perfect those which are in common use, and we shall very soon be convinced that, so far from diminishing the error, these new precautions do but render it more evident.

Relatively to carbon, the hydrocarbons in question, when they can be completely burned, always yield the same quantity of carbonic acid, whatever may be the process. In ordinary analyses, some carbon is always lost, for reasons which will be given farther on. It is the same with their hydrogen: the experiments have been greatly varied and multiplied, the same cyphers for the quantity of water produced by their combustion always being found: the method of analysis, therefore, is not to be blamed for this excess.

But the composition of water might be ill established. We have made direct experiments in this respect, and they are fully satisfactory. The composition of water, as given by the experiments of MM. Dulong and Berzelius, without being perfectly accurate, will receive from our experiments only an insignificant modification for the question with which we are occupied.

The composition of carbonic acid, therefore, remained, which it was necessary to subject to an attentive verification, and thence, we think it our duty to say, all our results, without a single exception, agree in pointing out a serious error, the sole cause of the above-mentioned deviations.

In the meanwhile, M. Berzelius, hearing of the change which one of us proposed, relative to the composition of carbonic acid, hastened to make new experiments on this subject. Instead of directly seeking in what proportion the carbon combines with

the oxygen, he preferred to make the analysis of carbonate and oxalate of lead. Now, admitting that these new analyses were correct, the only consequence that could now be drawn from it would be that the composition of the oxide of lead, on which they were based, was incorrect.

However, these questions must be cleared up, and we will not shrink from any experiments, however numerous and tedious, to which this necessity of revising the principal analyses, those which serve as the basis of all our speculations, compels us.

Thus do theories proceed, and hence their utility in the study of sciences. Their adversaries may content themselves with doubting facts; it is sufficient for them to say that they do not admit the consequences drawn from them; they are permitted to remain quite passive. Theorists have to fulfil quite another task: it is for them to prove their opinions by facts, to control the facts on which they at first relied, by still more evident ones. Some years ago, it was found that chlorine, in acting on organic compounds, removed their hydrogen, and that it took its place, volume for volume. In order that this rule may be applied to naphthaline or benzine, the first of these bodies, for example, must contain 94 of carbon, and 6 of hydrogen, whilst direct analysis gives 95·5 of carbon. The adversaries of the theory of substitutions have not failed to conclude from this, and with great apparent reason, that a theory which obliges them to admit that a body, in which 95·5 of carbon had been found, contains only 94, should be repudiated, and that seemed to them sufficient. We, on the contrary, being quite convinced that the rule of substitutions is a law of nature, have not hesitated to look for the cause of these deviations, where it existed, in the analysis of carbonic acid, and experiment has shown us to be right.

This proof was decisive: for, besides its having the authority of MM. Dulong and Berzelius, the analysis of carbonic acid is not an isolated fact in science. It is in accordance with the densities of carbonic acid and oxygen; it is connected with the densities of nitrogen and air; it relates to the density of all the carburetted gases, that is to say, that the admitted densities of most known carburetted gases may be modified by the single fact, that the analysis of carbonic acid is inaccurate, if Mariotte's law be true; for, admitting M. Despretz's experiments on this subject, the gases being unequally condensable by the same pressures, it would result that their densities are no longer in direct proportion to their chemical composition, and hence all the densities of gases which have been determined by calculation must be abandoned, and those furnished by experiment alone retained.

Every one will comprehend what infinite care we must have taken, and what attention we must have paid to an experiment so important—so decisive.

It was necessary, either to renounce the theory of substitutions; to see in its consequences so well confirmed by experiment, a series of chances or errors, without example in science; to forget all that is past, and shut our eyes to the future which these new ideas opened to us;—or to admit that MM. Berzelius and Dulong were mistaken in the analysis of carbonic acid; that there was an error in the densities of the oxygen and carbonic acid, or in the too general application of Mariotte's law. It must be supposed that almost all organic analyses were wrong, and that they had led to true formulæ only by compensations for errors. It was no longer permitted to us, indeed, to believe in the precision of $\frac{1}{1000}$ which M. Berzelius considers he has attained in the study of the proportion according to which the principal bodies of nature combined, for these proportions, as he has given them, would be found to agree with the determination relative to carbon, which presented an error of $\frac{1}{25}$.

Thus it became our only alternative to repudiate the theory of substitutions, or else to render doubtful the principal elements of the physical study of gases, as well as the bases on which all our atomic tables are founded. It will explain why the method which we have preferred does not require to be based on any numerical determination independent of experiment itself.

Hitherto indirect methods have been more particularly relied on for ascertaining the proportion in which oxygen and carbon combine. Sometimes it was obtained by the analysis of the carbonates, and sometimes, from the comparison of the densities of oxygen and of carbonic acid. In the first case, we were liable to error from operating on impure carbonates, for nothing is more difficult than to procure these salts pure and dry, and we were forced to consider the analyses of their oxides absolutely accurate. In the second case, we had to encounter difficulties of every kind, which, without speaking of the uncertainty which hangs over Mariotte's law, and the true coëfficient of the dilatation of gases, may be referred to the impurity of the gases, to the uncertainty attending the observation of their temperature, and to the hygrometric state of the glass of the vessels containing them, &c. We have preferred a simpler and more direct method.

We burned a known weight of pure carbon in oxygen, and weighed the carbonic acid thus formed. We made three series of experiments: the first, on natural graphite from the collection of the *Jardin du Roi*; the second, on artificial graphite ex-

tracted from a ferruginous mass, from a high furnace; the third, on the diamond.

The graphite which is purest in appearance requires a long and complicated treatment, if it be wished to free it from every oxidizable body. The following is the process which seemed best to us :—

To free it from earthy matters, it is heated to redness, with potassa: the mass is moistened, and the remaining graphite is plentifully washed with water. It is afterwards boiled in nitric acid and *aqua regia*, to free it from iron and bases. Finally, this graphite is exposed to the action of a current of dry chlorine and to an almost white heat for twelve or fifteen hours. It is surprising that products which have been boiled for a long time with *aqua regia*, should still yield chloride of iron by this means, for many hours. This, however, is the case.

Thus prepared, the graphite still contained here and there, perfectly colorless, sandy grains, which must be taken into the account, in weighing after the combustion. Besides, the different agents employed having corroded the lamellæ of graphite, the latter became capable of condensing air or moisture. Before each weighing, the matter must be burnt to redness, and allowed to cool under a bell glass, beside a vessel containing sulphuric acid. This weighing requires much attention: it was especially to obviate the causes of error inseparable from this operation, which, apparently is so simple, that we resolved on burning the diamond.

But we could not confine ourselves to burning small quantities of that precious stone, as all who have studied the combustion of the diamond have done. They had all investigated what the volume of oxygen gas became when converted into carbonic acid by the combustion of the diamond, which is much the same as comparing the respective densities of carbonic acid and of oxygen.

On the contrary, we wished to determine what weight of carbonic acid would result from a known weight of diamond; this simple and absolute method was the only one which could lead us to the discovery of the two proportions which we sought.

This experiment required the sacrifice of ten or twelve grammes of diamond, that is to say, an expence which at first made us hesitate, and which engaged us to reserve a portion of the diamonds, in order to repeat before such of our brethren as might feel some curiosity on the subject, our own experiments, or any other experiments they might wish.

The kindness of MM. Halphen, who furnished us with these diamonds at the lowest possible price, permitted us to select samples from large quantities, as to make some accessory observations which to be completed would require the assistance of persons better versed than ourselves in the study of minerals, and especially in the microscopical study of them.

All the diamonds that we burned left a residue—an ash, if we may so speak. This residue consisted, sometimes of a spongy matter of a reddish yellow tint, sometimes of yellowish straw-colored crystalline parcels, and sometimes of colourless, crystalline fragments. Although these residues have already been made the subject of an attentive examination by ourselves and by M. Elie de Beaumont, we will not say any thing concerning their nature until a more complete examination has put it beyond doubt.

That portion of the diamond which is not pure carbon, does not consist of parcels adhering to the surface of the burnt crystals or mixed with them. We have found the same residues in the combustion of very large crystals, well brushed, and boiled for a long time with *aqua regia*.

These mineral matters belong, therefore, to the crystal itself; they have been enclosed within its own plates at the time of their formation, and from their precise determination arises, as an inevitable consequence, the accurate knowledge of the geological situation of the matrix of the diamond, nature having deposited in the very crystals of this beautiful substance, the certificate of their origin, so long and so vainly sought after.

The question thus looked on is so worthy of attention, that it has in no small degree contributed to make us put forward all the means necessary for treating it to the uttermost. By choosing and studying with attention the diamonds which we still intend to burn, the question may still be resolved.

From their diverse aspect and their general nature, it might be foreseen that these ashes of the diamond would vary in their proportions. We have found at least 1 part of them in 2000 of diamond, and sometimes 1 in 500. We do not doubt that the purest diamonds, those whose color and transparency leave nothing to be desired, may burn without residue. But the rough or cut diamonds, which we chose on account of their cheapness, all left some appreciable mineral matter. We have most frequently operated on that class of diamonds which is unfit for the wheel, which lapidaries call *natural* diamonds, and which cannot be polished.

When we operated on graphite, we made use of a very simple process of combustion. The graphite, contained in a platinum tray, was placed in a very hard glass tube of a metre in length. Behind, was a mixture of oxide of copper and chlorate of potassa,

to furnish oxygen; before, pure oxide of copper strongly heated, and thus fitted to destroy all the oxide of carbon which could be produced.

Combustion was readily effected by these means, but the condensation and consequently the weight of the carbonic acid formed would have left us much uneasiness, if we had not had at our disposal the excellent process which M. Boussingault applies to the analysis of air, and which allows the least trace of carbonic acid or water to be appreciated. This process consists in passing the gases through tubes, filled with small pieces of pumice-stone, moistened with sulphuric acid, when it is required to retain water, and with potassa when it is required to absorb carbonic acid. After having thus been filtered through the pores of the pumice-stone thus prepared, the gases pass out perfectly free from water or carbonic acid.

Our first experiments on the combustion of graphite were executed by this method. However, when we afterwards wished to proceed to the combustion of the diamond, we felt some fears. Would the temperature which our tubes could bear be sufficient for burning the diamond? Were we not liable to lose some of our experiments by those defects so common in glass tubes, which cause them to break or to fuse? Were we quite certain of avoiding the presence of external humidity in an apparatus which it was necessary to arrange afresh for each experiment?

All these considerations decided us to make use of gaseous oxygen passing through a porcelain tube, in which the carbonaceous matter was heated to incandescence. The arrangements were so well made, that not only were all the experiments performed as preliminary studies concerning graphite perfectly in accordance with one another, but we had also the extreme satisfaction of seeing the success of the five combustions of the diamond which we executed, without the slightest accident.

In this new disposition of the apparatus, the carbon was introduced into a porcelain tube through which might be directed at will, a current of pure and dry oxygen. On leaving the apparatus, the gas passed through condensers which detained the carbonic acid and allowed the excess of oxygen to pass off. Some precautions were necessary, and they have formed the subject of a long and minute examination.

At first it was necessary that the oxygen should be entirely freed from carbonic acid. To this effect, it was collected in milk of lime, and made to pass into the same apparatus, by displacing it by aid of lime water poured in drop by drop. Besides, the gas passed through a tube of 1 metre in length, and 3 centimetres in diameter, full of pumice-stone saturated with liquid caustic potassa.

In order to deprive the gas of water, it was passed over pieces of solid potassa, then over pieces of glass covered with sulphuric acid, and finally into a tube of a few centimetres in length filled with pumice stones in grains, moistened with boiled sulphuric acid.

These precautions taken, we were able to pass a rapid current of gas through the apparatus for fifteen hours, without the tubes which were added to it, and which were capable of absorbing carbonic acid or water, experiencing the slightest alteration of weight, which was appreciable to a balance sensible to a milligramme.

Consequently, we were sure to find the least traces of water which might be formed at the expence of the hydrogen belonging to the carbonaceous matter which we proposed to burn.

It remained to be ascertained that we could gather without loss the whole of the carbonic acid formed. A few experiments gave us the most entire conviction that its condensation might be complete. Indeed, in adjusting to the tube in which the combustion is effected, a condenser filled with concentrated liquor potassæ, the greatest part of the carbonic acid was retained, namely, about 99 per cent. The small portion which escapes is, it is true, most difficult to collect, because it is mixed with a great quantity of oxygen, which prevents its absorption. However, it was easy for us to convince ourselves by passing the gas successively into fire U tubes, from 30 to 40 centimetres long, and full of pumice stone moistened with liquor potassæ, the three last did not change weight during the whole experiment. Almost all the carbonic acid which escaped from the condenser remained in the first U tube; the second gained but a few milligrammes in weight.

Thus when the gas goes out of the porcelain tube in which it served for burning the carbon, it is sufficient to pass it into a tube containing pumice stone moistened with sulphuric acid, to deprive it of water.

As for the carbonic acid, to absorb the whole of it, a condenser full of liquid potassa, two U tubes filled with alkalised pumice stone, and an U tube filled with sulphuric acid, to free the gas from the water which it may have acquired from the potassa itself, are all that are necessary.

These preliminaries settled, we devoted ourselves to the combustion itself.

To avoid all production of carbonic oxide, we have added a precaution to those which have already been mentioned. In the free part of the porcelain tube into which the gases pass after the combustion of graphite, we placed copper turnings; then, heating

the tube to redness, we directed into it for sixteen hours a current of air, to which succeeded a current of oxygen for the same time. The oxidation of the copper being thus completed, we proceeded to our combustions, with the conviction that the least traces of carbonic oxide would be converted into carbonic acid by passing through this sponge of incandescent oxide of copper.

We went even farther, when it was required to burn the diamond, for we passed the gas which left the porcelain tube, through a long tube of hard glass, full of oxide of copper, heated to redness.

All these precautions being taken, fifteen or twenty quarts of oxygen were passed into the apparatus, but without putting either diamond or graphite in combustion, not the slightest trace of water or carbonic acid is obtained.

After having circulated oxygen in the apparatus, air must be circulated, with the same precautions. The tubes remaining full of oxygen, and their liquors being saturated with it, they gain an excess of weight which they lose after the passage of air—returning to their primitive weight. This precaution was taken in all our experiments.

The apparatus being thus arranged and tried, one of the ends of the porcelain tube is opened; the tray containing the matter to be burned is pushed in, it is again closed, and the experiment commences.

At a little below red heat, the natural graphite of Ceylon, on which we operated, burns brilliantly. The oxygen which passes off is almost entirely converted into carbonic acid, while there remains any graphite in the tray. It is not thus with artificial graphite; its combustion is much more difficult; there passes off during the whole experiment a mixture of oxygen and carbonic acid, where free oxygen abounds.

These two varieties of graphite give the same results. At first they did not contain any appreciable trace of hydrogen. It often happened that the tubes destined to condense the water did not vary in weight: sometimes they had gained a milligramme. Neither natural nor artificial graphite, therefore, contains any hydrogen. As for the carbon, we will show by an example, how great an error we had to correct. In an experiment where 1471 of artificial graphite were burnt, 5395 of carbonic acid were collected. If we calculate how much carbon this carbonic acid contains, according to M. Berzelius, 1491 would be the result. It must, therefore, be admitted that there is a mistake of 20 milligrammes in weighing the graphite with a balance sensible to a quarter of a milligramme. If, on the other hand, we calculated how much carbonic acid the 1471 of graphite ought to have yielded, according to M. Berzelius, it is found to be 5315, that is, 81 milligrammes less than we had obtained. Now it is impossible to admit any error in this weight beyond one or two milligrammes.

According to our experiments on the combustion of graphite, natural as well as artificial, 800 parts of oxygen combine with 300 of carbon to form 1100 of carbonic acid. It is, therefore, 8 of oxygen to 3 of carbon.

If we wished to follow the established custom, we might say, taking the mean of nine experiments which we have made on the combustion of graphite, that the proportion is not exactly that of 8 to 3, but rather of 800 to 299·93.

We have already said whence it comes that the relation between oxygen and carbon, really being as 8 to 3, is not however absolutely obtained by means of graphite; it is because graphite is very difficult to weigh accurately. If it be weighed when warm, it does not contain air, but the balance is interfered with by the currents of air which it causes. If it be weighed while cold, it retains two or three milligrammes of air or moisture. We have tried all means of obviating this difficulty, without being fully satisfied.

As the diamond is not porous, we were enabled to obtain a degree of accuracy in our results, not afforded by graphite. In five combustions of the diamond, three gave the proportion of 8000 oxygen to 3000 carbon. The two others deviated from it only in a very trifling degree.

The first time that we burned the diamond, we had it weighed by a person who was a stranger to our experiments, we remaining ignorant of its weight. We acted on pieces of diamonds as much to try the apparatus as to make a precise experiment. The combustion finished, we found 2598 of carbonic acid, and we concluded that the diamond burnt had weighed 708 milligrammes. At the declaration of this the person who had weighed the diamond was much surprised; she had put 717 milligrammes in the tray. We told her that she would find nine milligrammes residue in the tray, and it actually did contain 9 milligrammes of pieces of Brazilian topaz.

It was to avoid these accidental mixtures, that, in our other experiments, we always operated on large crystals, and perfectly recognised as diamonds by M. Halphen. Thus this accident has not again occurred.

But in our first experiment, we were surprised at the extreme facility with which the diamond burned; it showed itself to be more combustible than artificial graphite. We thought that this might depend on the

division of the small pieces of diamond employed: we were mistaken.

In burning four or five large crystals, the formation of carbonic acid is so rapid that all the oxygen is converted into carbonic acid. Under the same circumstances, artificial graphite would allow at least one-third of the oxygen to pass off without burning.

This ready combustibility of the diamond has occupied much of our attention. The artificial graphite compared with it had, it is true, supported the heat of a high furnace, but no one would have supposed that it would resist combination more than the diamond itself.

This circumstance has given rise to doubts relative to the presence of hydrogen in the diamond.

Some of our experiments have been directed towards this point, and we can most positively affirm that the quantity of water resulting from the combustion of 1500 milligrammes of diamond is not appreciable by a balance which is very sensible to a milligramme. The diamond, therefore, cannot contain $\frac{1}{15000}$ of hydrogen.

However, in weighing the diamond and the carbonic acid resulting from it, we found by experiment that the oxygen and carbon combine in the proportions of

8 : 3,
80 : 30,
800 : 300,
8000 : 3000.

So far we are within the limits of the experiment, without going out of simple relations; but another cypher gives.

80000·3000·2.

Let us be careful, however, of substituting this more complex proportion for the other, for to this extent we can no longer make the weights answer, either of the diamond or of the carbonic acid itself.

The following is a table of all our experiments:—

COMBUSTION OF NATURAL GRAPHITE.

Graphite employed. gr.	Carbonic acid obtained. gr.	Proportion between the Oxygen and the Carbon.
1·000	3·671	800 : 299·5
0·998	3·660	800 : 300·5
0·994	3·645	800 : 299·9
1·216	4·461	800 : 299·8
1·471	5·395	800 : 299·9

COMBUSTION OF ARTIFICIAL GRAPHITE.

0·992	3·642	800 : 299·5
0·998	3·662	800 : 299·7
1·660	6·085	800 : 300·1
1·465	5·365	800 : 300·5
Mean		800 : 299·93
Atom.		74·982

COMBUSTION OF THE DIAMOND.

0·708	2·598	800 : 299·7
0·864	3·1675	800 : 300·0
1·219	4·465	800 : 300·4
1·232	4·519	800 : 300·0
1·375	5·041	800 : 300·0
Mean		800 : 300·02
Atom.		75·005

In taking account in the weight of the diamond, of the weight of air which it displaces, and in that of condensed carbonic acid which it also displaces, these proportions were not altered.

As oxygen manifestly combines with carbon in the proportion of 8·3, it would, perhaps, be as well here to discuss the reality of Dr. Prout's law. That learned English chemist admits that the proportions according to which simple bodies combine together, are expressed by numbers, all of which are multiples of hydrogen, by an entire number. Thus, 1 part of hydrogen would combine with 8 parts of oxygen to form water, and with 3 parts of carbon to form carburetted hydrogen, or marsh gas. Our experiments fully confirm this remark, to which we will recur, when more extended investigations have enlightened us concerning the extent to which it may be used.

In presenting to the Academy our results relative to the combustion of carbon, we could have wished also to acquaint it with our investigations concerning the atomic weight of carbonic acid and oxygen. The delay which we are forced to make in this communication does not require explanation to persons who know the difficulties of this kind of experiments: we hope, however, to overcome them, as will very soon be seen.

From the above it results that the hydrocarbons to which formulæ were given by the theory of substitutions should retain their formulæ; but it also necessarily results that their ponderal analyses were false when they agreed with these formulæ.

M. Berzelius having admitted that carbonic contains more carbon than it really does, the true formulæ of bodies would in most cases have been wanting, if the superfluity of carbon had not been lost in the calculation.

This loss of carbon occurs in four different ways, and it would be surprising that they have not been before remarked, if the compensation which we have just indicated, had not blinded chemists on this point.

When an organic analysis is made, the matter is burned with the assistance of oxide of copper. The water formed is collected by means of chloride of calcium, and the carbonic acid by means of an aqueous solution of potassa; a little air is then driven through the tubes in order to make all the

water and carbonic acid pass into their respective condensers.

Carbon is lost in this process:—

1st. Because, whatever care may be taken, some of it is deposited about the tubes, which, for want of oxygen does not burn:

2nd. Because the reduced copper is partly converted into carburet of copper:

3rd. Because the liquor potassæ allows some of the carbonic acid to escape:

4th. Because the air which is made to circulate through the apparatus, attracts water from the potassa and diminishes its weight.

This is the reason why the error concerning the composition of this acid has so long remained unperceived. That which was added by calculation was lost on the other, and the analyses seemed excellent, although in reality they were very faulty.

In order that organic analysis might possess all the precision which the investigations that remain for it to accomplish require, the methods of conducting these analyses stood in need of being greatly modified. We have arrived at accurate and always uniform results, by the following process:—

1st. We triple, at least, the quantity of matter ordinarily employed:

2nd. When the analysis is finished we pass into the tube a great quantity of oxygen, in such a manner as to burn all the carbon deposited, and to reoxidize the copper, which frees it from carburet of copper:

3rd. To collect the water, we employ a tube of chloride of calcium, accompanied by a tube containing pumice-stone charged with sulphuric acid.

4th. To absorb the carbonic acid we used an apparatus containing liquid potassa, followed by a tube containing moistened potassa on one side, and dry potassa on the other; the dry potassa attracts any water with which the gas may be charged.

After having disengaged the oxygen, dry and pure air is passed into the apparatus, in order to free it from the atmosphere of oxygen which would increase the weight of the tubes.

In making by this process, which is of an absolute precision, the analysis of the same matters, we always obtain the same numbers, with such slight differences that a like precision is very far from ever being obtained.

A few examples will show, besides, how serious were the errors committed in the former analyses.

In naphthaline was found 94 of carbon; we found 95·5:

Benzine, which furnished 92·3 of carbon; it gave us 93·5:

In camphor, which contained 79·2, we found 80·2:

Benzoïc acid, in which we found 69·2, yielded 69·8; and so on with all very pure acid and well-defined bodies which we have analysed.

In making an accurate analysis of any organic compound, a complete difference would be found between the calculation and the analysis, if the composition of carbonic acid admitted by Berzelius be adopted. This difference no longer exists when the above-mentioned results of the composition of carbonic acid are employed.

By the mode of analysis which we have just described, the determination of the hydrogen acquires such extraordinary accuracy, that the cypher may almost always be regarded as absolutely correct.

The two objects which we proposed to ourselves, are therefore attained. We are certain of the composition of carbonic acid, although beyond what our most delicate investigations require. We possess a process by means of which organic analyses can be made with absolute precision.

The new field for study which these investigations opens to us, remains to be explored; we shall do so with all the ardor which the certainty of being useful to the progress of science inspires; and, nevertheless, with all the reserve which the importance of the questions imposes, and which are, indisputably, some of the most important that natural philosophy can attain to, for they touch on the true nature of the reputed simple bodies.

ANALYSIS OF THE WATERS OF THE AFRICAN COAST AND RIVERS.

The Lords of the Admiralty lately transmitted to Professor Daniell, of King's College, eight bottles of water taken up in the rivers and on the coast of Africa, with a request that he would analyse them, and report as to their effects on the copper sheathing of ships, of which they were found to be especially destructive. During these investigations some very curious and unexpected results came out incidentally, tending to show the probable cause of the miasma, which has such destructive influence on that coast—results especially interesting at this moment, when the Niger Expedition is just about to leave our shores:—

"The most remarkable circumstance, (says Professor Daniell), disclosed by the analysis of these waters, is the strong impregnation of the majority of them with sulphuretted hydrogen; which, in the case of the water from Lopez Bay, amounts to almost as much per gallon as in the Harrow-

* From *The Athenæum.*

gate waters. The proportions of the saline contents do not differ materially from those which are usually found in sea water.

"The extraordinary presence of this gas would naturally lead at first to a suspicion that it might arise from some change which had taken place in the waters after they had been bottled, from the decomposition of some animal or vegetable substance, but this suspicion is inconsistent with facts. On the other hand, it is difficult to conceive how such a striking and important fact as the impregnation of the waters of the ocean, upon such a long line of coast, with this deleterious gas, could so long have escaped observation. It is highly desirable, in many points of view, that its existence should be substantiated, and the limits of the phenomenon both along the coast and in the ocean, ascertained by further evidence. Its effects upon the copper sheathing of ships cannot fail to be highly injurious, and a question of still higher interest even arises, whether this deleterious gas may not contribute to the well-known unhealthiness of the coasts, from which these waters are taken.

"Upon searching for evidence of a similar phenomenon having been observed before, I have found in the Philosophical Transactions for 1839, a memoir of the late Dr. Marcet, 'The specific gravity and temperature of sea-waters, in different parts of the ocean, and in particular seas, with some account of their saline contents.' Out of sixteen specimens which he examined, he found one which was brought by Captain Hall from the Yellow Sea, in the Chinese Ocean, which from the account he has given, must probably have been as highly charged with sulphuretted hydrogen, as those which I have just examined from the coast of Africa; and he observes, 'there is something in the development of sulphur in sea-water, which is by no means well understood.'

"He also noticed, that a specimen brought by Mr. Schmidtmeyer, going to South America, from latitude 10° 50′ north, longitude 24° 26′ west, had an hepatic smell, and had blackened the bottle in which it was contained. If the existence of this curious phenomenon should be confirmed, the origin of the sulphuretted hydrogen will probably be found to be the same, as that of the same gas in various saline lakes in different parts of the world, from which trona or natron is derived.

"The mud of the Lonar Lake in India, of a lake near Maracaybo, in South America, and of similar lakes on the North of Africa, are all found to be thus impregnated. The sulphuretted hydrogen thus adhering to the clay, has been supposed to be derived from volcanic sources, but Mr. Malcolmson, in an able memoir lately printed in the Geological Transactions, says, that he has observed 'the same phenomenon in the salt water inlets, along the Indian coast, wherever the bottom contained argillaceous and carbonaceous matter;' and he ascribes the effect to 'the decomposition of the sulphates in the water by the carbon, and the clay only prevents its passing off into the air, or mixing with the water, by the power of adhesion.'

"The subject is full of interest, both in a practical and scientific point of view, and well worthy of investigation."

In a subsequent Report on additional specimens, Professor Daniell observes:—

"It is impossible not to speculate upon the origin of the deleterious gas, which has now been proved to impregnate the waters upon the Western Coast of Africa, in such enormous quantities, through an extent of more than sixteen degrees of latitude. It appears to me, that there are only two sources to which it can with any probability be referred, namely, submarine volcanic action, in which case its evolution might be considered direct or primary; and the reaction of vegetable matter upon the saline contents of the water, in which case it would be secondary.

"The probability of a volcanic origin is, I think, small, from the absence, I believe, of any other indications of volcanic action, and from the great extent of the coast along which it has been traced. What is known of the action of vegetable matter upon the sulphates, and the immense quantities of vegetable matter which must be brought by the rivers within the influence of the saline matter of the sea, renders, on the contrary, the second origin extremely probable. Decaying vegetable matter abstracts the oxygen from sulphate of soda, and a sulphuret of sodium is formed. This again acting upon water decomposes it, and sulphuretted hydrogen is one of the products of the decomposition.

"You will perceive that there is a large proportion of the sulphates in the different specimens of water which have been analyzed, and there can be little doubt, I imagine, that extensive mud banks must be formed at the mouths of most of the rivers on the western coast of Africa, within the tropics, consisting chiefly of vegetable detritus in the exact state which is most favourable to the action which I have described. This view rests upon experimental evidence, and upon considerations of great cogency, derived from the unhealthiness of certain well-known situations in which decaying matters from tropical vegetation are brought into contact with sea-water. I feel more than ever convinced, that the evolu-

tion of sulphuretted hydrogen is intimately connected with the unhealthiness of such stations.

"When this matter was first brought under my consideration, I was surprised that the nauseous smell which must necessarily be evolved from water impregnated with this gas, at so high a temperature as that of the equinoxial regions, had not been noticed. I have in consequence turned to some of the accounts of the late travels in Africa, to seek for evidence upon the subject; and in the narrative of an expedition into the interior of Africa, by the river Niger, by Macgregor Laird, and R. A. B. Oldfield, I found the following important observations: —' The principal predisposing causes of the awful mortality, were in my opinion the sudden change from the open sea to a narrow and winding river, the want of the sea breeze, and the prevalence of the deadly miasma, to which we were nightly exposed from the surrounding swamps. *The horrid sickening stench* of this miasma must be experienced to be conceived: no description of it can convey to the mind the wretched sensation, that is felt before and after daybreak. In those accursed swamps, one is oppressed not only bodily but mentally, with an indescribable feeling of heaviness, languor, nausea, and disgust, which require a considerable effort to shake off.' Now, these observations were made in the very locality from which some of the first waters which I examined were taken, and nothing more is wanting to identify the cause of the rapid decay of the ship's copper with that of the mortality of the climate. It has been experimentally found, that so small a mixture as a fifteen-hundredth part of sulphuretted hydrogen in the atmosphere, acts as a direct poison upon small animals, and the sensations of languor and nausea, described by Mr. Laird, are exactly those which have been experienced by persons who have been exposed to the deleterious influence in small quantities. The peculiar unhealthiness of mangrove swamps in all parts of the world, I have little doubt, arises, from that tree requiring salt water for its growth, and its decaying foliage being thus brought into immediate contact with the sulphates. The hypothesis also agrees with the fact, (which I believe has been established,) that the unhealthiness of such situations does not extend to any considerable distance from the sea."

ON THE PRESENCE OF URIC ACID IN THE GARDEN SNAIL, AND IN OTHER SPECIES OF THE GENUS HELIX.*

BY C. MYLIUS, OF BERLIN.

Uric acid, which M. Figuier unsuccessfully sought in the excrements of these animals (see *The Chemist*, Vol. I. p. 158), may be found in a glandular organ, immediately under the shell, secreted in the solid form. To obtain it, it is sufficient to make an incision and to collect the white liquid which it contains. When a certain quantity has been collected, it is shaken up several times with water, the mucus is thus held in suspension, and is decanted, whilst the uric acid is precipitated to the bottom.

This acid, thus obtained, is in pulverulent non-crystalline form. Examined microscopically, it presents perfectly spherical transparent grains, of various sizes. Each snail yields about nine centigrammes of it.

This acid has also been met with in other species of the genus Helix. The author found it in the *Helix Pomatia*, the *Helix Nemoralis*, &c. but not in snails of the genera *Limnæa* and *Planorbis*.

To prove the identity of this substance with uric acid, he made the following experiments:—

It did not dissolve in cold water: but little of it was dissolved by boiling; but on cooling a very opaque milky cloud was formed; the solution reddened turnsole. It did not dissolve in ether.

Alcohol has no action on it, either warm or cold; it is the same with muriatic and dilute sulphuric acids.

Nitric acid dissolves it with effervescence: the liquor reddens by the addition of ammonia: when it is evaporated and exposed to the vapors of ammonia, a magnificent purple color is produced.

It did not dissolve in a concentrated solution of potassa; but when diluted, it dissolves in it in very considerable quantity. Submitted to boiling with this solution, it does *not* disengage ammonia. The acids separate from it uric acid in a white powder. If it be located in a glass tube, carbonate of ammonia is sublimed and ammoniacal gas is disengaged: afterwards a very sensible odour of hydrocyanic acid and empyreumatic oil is developed, and a little carbonaceous matter remains. This substance burns without residue in a platinum crucible.

From these investigations it results that the uric acid of the snail is not combined with either ammonia or a fixed alkali, but that it is secreted in the pure state. Jacobson found uric acid in the garden snail, but he did not prove its purity.

* *Journal für Praktische Chemie*, Vol. xx, No. 8.

ON THE PRESENCE OF URIC ACID IN MOLLUSCOUS ANIMALS AND OTHERS OF INFERIOR CLASSES.*

BY M. J. J. VIREY.

Jacobson first discovered, in several gastropede animals, that the vessel containing the coloring matter is an urinary organ, with uric acid. M. Blainville, in his *Malacologie*, extends this observation to most testaceous and naked animals, showing that this bladder or purse being opened at the skin of the animal, yields urate of lime, with more or less color, forming the bands or maculæ of the shell of many of these animals. The same apparatus of depuration, furnishes the brilliant purple of *murex*, *buccinum*, *purpura*, *strombus*, &c. It is also to be remarked that, by different degrees of oxidation, urea also produces, according to Prout, rosacic and purpuric acids, &c.

This is not the only example of a deposit of urate of lime for the formation of shells; those of *birds' eggs* and of other *oviparous* animals (tortoises, crocodiles, lizards, serpents) more or less solid from the phosphate and carbonate of lime deposited on the gelatinous membrane which surrounds them, result from the calcareous salts brought there by the ureters of these animals in the *cloaque* where the oviducts terminate. Everybody knows that the excrement of birds, composing *guano*, and that of serpents, abound in urate of lime. The same, also, as the gouty see articular concretions of this matter deposited under their skin, on their feet and hands.

In like manner, insects present excretions of uric acid or urate of lime. Brugnatelli remarked abundance of it in the skins shed by silk worms. Many coleoptera, such as the cantharides and others, gave, by chemical analysis, uric acid (and these insects, taken internally by man or animals, act, more especially, on the urinary organs.) It is therefore a very general product of urinary depuration, even in animals to which nature has given neither bladders nor liquid urine.

ON THE PREPARATION OF THE WHITE OXIDE OF ARSENIC IN CORNWALL.

BY W. G. HENWOOD, F.G.S., LONDON AND PARIS.

Secretary of the Royal Geographical Society of Cornwall.

It is well known that the ores of tin are often so mixed with those of copper and iron, that their separation is an operation of much difficulty and expence.

This is greatly facilitated by roasting them in a common reverberatory furnace, whereby the specific gravity of the two last is much diminished, and the sulphur and arsenic with which they are combined are expelled. This poisonous mixture is prevented from injuring vegetation in the neighbourhood of the furnace, by being passed through a very long horizontal flue, or by being conveyed into a large and close chamber, in which it is deposited.

The substance thus collected consists almost wholly of sulphur and arsenic, and it was for many years rejected as utterly worthless. About thirty years since it was thought however, that the white oxide of arsenic might be extracted from it; this was successfully attempted by the late Dr. Edwards, who established a manufactory for the purpose near Parrenwell, which was long the only one in the United Kingdom. Within four or five years a second has been erected near Bissoe-bridge, and a third has been more recently set at work near Redruth.

The materials are now collected from the *burning houses* in all parts of Cornwall; and the principle adopted in their separation is the difference of temperature at which sulphur and arsenic sublime; the former being about 300°, the latter 330°.

They are first put into a common reverberatory furnace, having a very long flue, and the heat is so slowly increased as to dissipate the sulphur before the arsenic is volatilized; and this is assisted by means of small fires communicating with the flue in different parts, by which means the sulphur is carried far on it.

The temperature is then carefully raised, and the arsenic is driven off; but as the arsenic requires a greater heat than the sulphur, it is therefore more readily deposited on the sides of the flue. When this has been continued for a sufficient time, perhaps weeks, or even months, the fire is extinguished, the flue is opened, and its contents removed. The finer and purer parts of the arsenic are found, in a crystalline state, nearest to the fire; and as the distance from it increases, it is more and more mixed with sulphur: this is again placed before the furnace for a repetition of the process.

The purer portion is now introduced through a hole at the apex into conical cast-iron retorts, of about 2½ feet high, and from 15 to 18 inches in diameter at the base. The broader ends of these are clamped to an iron plate, which forms the upper side of a flue from a rather small but very brisk fire, and the joints are closed by luting; the aperture at the top being shut by a plain iron stopper only. When the work-

* *Journal De Pharmacie*, Dec. 1840.

man thinks that the first charge has been all sublimed, he removes the plug, and through a funnel introduces a further supply, and so on until he imagines a sufficiently thick crust has been deposited within; the clamps are then taken off, the retort is conveyed into the open air, and its place is supplied by another.

These, whilst at work, are placed beneath a dome opening into the external air, in order that the labourers may not be injured by inhaling the mixture of vaporized arsenic with the atmosphere of the workshop.

The arsenious acid thus lining the retort is usually about an inch thick, and is very easily removed; it is of a pale amber color, and in that state large quantities of it are sold: sometimes, however, it is reduced to powder, and this is done in a grist mill of the ordinary kind.

This method is essentially different from the German mode, described by Mr. Vivian. (Cornwall Geological Transactions, I. p. 61.)

All attempts to prepare orpiment and regular (the red and yellow sulphurets of arsenic), in Cornwall, have hitherto been fruitless; and experiments on the extraction of arsenic directly from the arsenical pyrites, have been, in point of economy, equally unsuccessful.

It is not easy to ascertain the quantity of arsenious acid manufactured in this county. In 1826, 83 tons of it were shipped at Penryn (Cornwall Geological Transactions, III. p. 360), at present I believe not less than from 600 to 800 tons are prepared annually.

ON THE FOUL AIR IN THE CHALK AND STRATA ABOVE THE CHALK NEAR LONDON.*

In the last part of the proceedings of the Geological Society of London, the following communication, by Dr. James Mitchell, appears:—

In the chalk, the most abundant deleterious gas is the carbonic acid, but it has been found to exist in greater quantity in the lower than in the upper portion of the formation, and in that division to be unequally distributed. In sinking wells it has been noticed to issue with force from one stratum, whilst none has been perceived to be given out from the beds immediately above and below it. Dr. Mitchell mentions fatal effects owing to its occurrence in a well near the race-course at Epsom, where it was met with at the depth of 200 feet; and in Norbury Park, near Dorking, at the depth of 480 feet. On Bexley Heath, after sinking through 140 feet of gravel and sand, and 30 feet of chalk, it rushed out and extinguished the candles of the workmen; and in making a well in Long Lane, Bexley Heath, after penetrating 124 feet of overlying deposits, and then 90 feet of chalk, considerable inconvenience was felt from it, but six feet lower no gas was emitted.

In chalk, sulphuretted hydrogen gas is also occasionally met with, and is supposed to be generated from the decomposition of water and iron pyrites.

In districts in which the chalk is covered with sand and London clay, carburetted hydrogen gas is sometimes emitted, but more frequently sulphuretted hydrogen gas.

Carburetted hydrogen has seldom inflamed in wells, but in making the Thames Tunnel, it has sometimes issued in such abundance as to explode by the lights and scorch the workmen.

Sulphuretted hydrogen gas is more abundant, and it has been observed almost always to proceed from a coarse black sand, charged with oxide of iron, whether the bed be above the blue clay, within it, or below it. It has streamed out with great violence in the Thames Tunnel, but has in no instance produced fatal effects. At Ash, three miles from Farnham, a well was dug in sand to the depth of 36 feet, and one of the workmen on descending into it was instantly suffocated. Fatal effects have also resulted from the accumulation of this gas in wells in Maiden Lane, Battlebridge, and at Applexburg Street, near Cheshunt. This gas is much increased, after long continued rain, in consequence of the swelling of the clay driving it out of the interstices; and it is diminished after a long drought. The prevalence of a north-east wind has been noticed by well-diggers to diminish the quantity of the gas, but the effect is ascribed by Dr. Mitchell to the dry weather, which accompanies wind from that quarter. The author also suggests, that if wells are to be dug in dangerous districts, they should be undertaken when there is least water in the ground, or from the beginning of July to October.

The noxious gas in the weald of Kent and Sussex is stated to be sulphuretted hydrogen.

* From *The Inventors' Advocate*, No. 81.

A GALVANO-ARSENICAL APPARATUS†.

At the last meeting of the Royal Institution, Mr. S. T. Martin, of the Royal Veterinary College, exhibited this apparatus. The action depends on a well-known power, viz., that of resolving water into its constituents, and effecting the reduction of the metals.

The vessel and tubes being filled with a

† *Inventors' Advocate*, No. 81.

suspected fluid, rendered slightly sour by the addition of sulphuric acid (so as to make it a better conductor of electricity), is to be connected with a galvanic battery of a few plates, by means of electrodes dipping into mercury cups, when decomposition will immediately commence, and if any arsenic be present, the metal *arsenicum* will be resolved at the negative electrode in combination with hydrogen, forming arsenuretted hydrogen gas, which rising will displace the water in the tube.

As soon as the tube is full, the stop-cock is to be turned, and the gas inflamed as it issues from the jet, when on holding a piece of porcelain or a watch-glass over the flame, a metallic film will be deposited on it. That this is arsenicum is to be proved by the usual tests.

A solution of one grain of arsenious acid in a gallon of water, or of one part in above 76,000, has by it been made to yield many metallic films, and it is possible that the division might have been carried much farther, and yet indications of the existence of the poisonous agent obtained.

A DESCRIPTION OF A NEW FORM OF MAGNETO-ELECTRIC MACHINE, AND AN ACCOUNT OF A CARBON BATTERY OF CONSIDERABLE ENERGY.*

BY OLIVER W. GIBBS.

It is well known, that if a soft iron bar be wound with insulated wire, and caused suddenly to approach and recede from the poles of a magnet, temporary magnetism will be induced in the bar, and an electric current in the wire surrounding it. This fact led to the construction of the magneto-electric machine, the principle of which consists in alternately induceing and destroying magnetism in a bar similarly wound with large wire for sparks and deflagrations, and with small for shocks and chemical decompositions. About eight months since it occurred to me that a more simple machine than those commonly used (and which all I believe resemble that of Saxton) might be constructed. My plan was, to take a bar of soft iron of an inch in diameter by ten inches long, and to slide upon the middle a disk of brass of two inches radius. This would divide the bar into two parts, upon one of which is to be wound three or four hundred feet of copper bell-wire well insulated, and upon the other and separated from the first by the brass disk, about four times that length of fine wire, say No. 25. If now one extremity of the coarse wire be attached to one pole of the battery, and the communication between the other extremity and the other battery pole be alternately made and interrupted by means of a rasp or toothed wheel, magnetism will be induced or destroyed in the iron bar, and consequently an electric current will circulate through the fine wire. The use of the brass is to prevent by means of a closed circuit any immediate induction in the fine from the coarse wire, which would inevitably take place were none interposed, and which would convert the instrument from a magneto-electric to an electro-magnetic machine.

Since the above was devised, an obvious improvement has suggested itself. This is founded upon the fact that magnetism is strongest at the extremities of bodies; and consists simply of dividing the bar into three equal spaces by means of two disks of brass similar in size to the one already described. The central division is then to be wound with the coarse, and the two outer or polar divisions with the fine wire connecting the two outer helices in such a manner that they may form one long wire. The battery current is then to be passed through the coarse wire, and the connection made and interrupted as before, by a rasp or other interrupting apparatus. As thus constructed, the instrument would produce effects similar to the common magneto-electric machine when used for shocks or decomposition. If it be desired to produce sparks and deflagrations, it would only be necessary to slide off the coils of fine wire from the poles, and to substitute in their stead others made of coarse wire of shorter length, and then transmit and interrupt the current through the central coil as before. We should then have within a much smaller compass, an instrument capable of producing all the effects of the common machine of Mr. Saxton, and by combining a number of such bars, we might form, in a comparatively small compass, a magneto-electric battery of great energy. Some of Dr. Page's beautiful interrupting apparatus might doubtless be used successfully with this instrument. As I have no opportunity to construct the instrument myself, I would suggest the trial, especially of the latter form of apparatus, to any who may be interested in the subject. Should it succeed, its advantage would be its superior cheapness and power, (?) and the little space it would occupy.

About the same time that the above instrument was devised, in looking over the list of substances which are capable of forming a galvanic circle together, I was struck with the much higher electro-negativeness of charcoal than of copper in relation to zinc; there being but six substances between zinc and copper, while there are eleven between zinc and carbon, which,

* From *Silliman's Journal.*

moreover stands even higher than gold, and next below platina. Besides this, its excellent conducting power seemed particularly to qualify it to act as an electrometer. Accordingly, I was led to consider that it might form an excellent battery with zinc or its amalgam, and mentioned the opinion to Prof. Renwick. I was, however, prevented from experimentally demonstrating its powers, until, in the month of March, I perceived in one of the foreign journals a short account of a carbon battery which had been successfully tried in England. I immediately constructed a small battery consisting of only six pairs of zinc and bituminous coal, and arranged as a *courronne des tasses*. The zinc plates were an inch square, consequently there were only six inches of acting zinc surface; the exciting liquid was diluted sulphuric acid. With this battery pure water was easily and rapidly decomposed, though from not having platina electrodes, and from the want of a voltameter, the gas collected was not measured. This experiment was witnessed by Mr. Shaeffer, assistant Professor of Chemistry in the College.

To those who possess batteries of considerable power, I would suggest the employment, in some form, of carbon for electrodes in the place of platina. I hope soon to be able to present a series of experiments on the relative advantages of copper and carbon, especially in the case of the constant battery.

CONVERSION OF FIBRIN INTO ALBUMEN.*

M. Letellier announces that he has succeeded frequently in performing successfully the experiment of Denis, viz. of converting fibrin into albumen, by boiling 46 grs. of fibrin well washed and pressed in 155 grs. of water, and 7 grs. of carbonate of soda, until the magma which the mixture formed has disappeared. This result is in accordance with the view broached by Dr. Thomson, of Glasgow, upwards of thirty years ago, that albumen owed its fluid state to the presence of soda.

* From *The Athenæum*.

II. CHEMICAL MANUFACTURES.

IMPROVEMENTS IN THE ELECTROTYPE.†

At the sitting of the Academy of Sciences, Paris, on the 1st inst., M. Melloni made the following communication in the name of M. Cirelli, mentioning an improved method he has adopted of taking impressions in copper by the electrotypic process, directly from the drawings on paper.

"M. Cirelli, director of the Polygraphic Institution, at Naples, has sent a letter and various documents to me, relative to a new method of engraving on metal, by means of the galvanoplastic process. The first attempts of M. Cirelli commenced many months ago. Two Italian periodical papers, the *Lucifer* and the *Journal du Royaume des Deux Siciles*, allude to them in the numbers of the 15th of July, 1840. The inventor did not propose to obtain the copy of a model, or of an engraved plate, either indented or in relief, by two successive operations, but, by means quite independent of the art of engraving, to immediately produce the metallic plate accurately engraved, from a design, a lithographic print, or any other copy drawn on paper. M. Cirelli has already obtained a patent to make use of his method in the kingdom of Naples. He is not unacquainted with the galvanoplastic discoveries of Messrs. Boquillon, Sayes, Jugé, and Kobell; but he adds, that the investigations of these gentlemen are entirely different from his own; thus he has thought it desirable to distinguish the new art, which he has just discovered, by the particular denomination of electrotypy." We shall give an extract from M. Cirelli's letter. After briefly adverting to the principle on which the deposition of the metal is obtained from the solution of the sulphate of copper, he observes:—"In order to explain myself more clearly, I will submit to you the problems that I have proposed to myself, which I have solved.

"First—A design being given of any description whatever, traced upon paper, with certain peculiarities, which in no degree increase the difficulties of the artist, to produce the engraving of the same design on a sheet of revivified copper, by the process of Jacobi, and this to take place during the time that the sheet is forming, and without the hand of the engraver having any thing to do with it.

"Second.—A proof of an engraving being given, drawn with certain precautions, either from a plate engraved on copper or on steel, or from a lithographic design, to form in the same manner an engraving from this proof.

"Third.—Having obtained the first engraved plate in the manner that I have men-

† *Inventors' Advocate*, No. 81.

tioned, to repeat the operation many times successively on the same design, or on the same proof, so as to produce a great number of engraved plates, and all exactly similar, which only requires the time and expense necessary for the precipitation of the copper."

In support of these propositions, M. Cirelli sent four plates, which did not admit of the least doubt respecting their electro-chemical origin, because the engraving on the front surface was equally distinct on the back; the two designs exactly corresponded, line for line, point for point, in every part. The first of these plates presented the figure of Volta with letters, and an outer line ornamented with figures and arabesques; it was produced from a lithographic proof. The second, taken from a drawing, represents the Hebe of Canova. The two others are duplicate sketches of an inscription, in which the inventor dedicates his attempts to the Academy. The second metallic drawing appears more pure, and is better executed. M. Cirelli also added many specimens from proofs drawn on paper.

It may be said, further, that though these experiments appear very remarkable, they are capable of great improvement. The inventor proposes to submit to the examination of the Academy new engravings, which he hopes to bring to perfection. This presentation he will accompany with a memoir, in which he will describe the modifications to which he has subjected the apparatus of Jacobi and of Spencer; he will at the same time make known the various modifications of which electrotypy appears to him capable.

ON VARIOUS APPLICATIONS OF THE REDUCTION OF METALS BY GALVANISM.—ON THE MULTIPLICATION OF COINS AND MEDALS.

To the numismatist, the reduction of the metals by galvanism is of the highest importance; for on the one hand it presents him with the means of having casts of coins and medals, which on account of their great rarity he could never otherwise possess,—and on the other hand it affords to the coin manufacturer the means of forging the more scarce coins, so that the collector must be doubly careful in making his purchases. At present, I am afraid, that our art, in unskilful hands, has been the means of destroying so many medals, that no benefit which has yet accrued has been able to compensate for their loss. There are three methods of taking the duplicate of a coin or medal. By the first, a primary cast or an intaglio is made in metal, directly by the galvanic precipitation; by the second a metallic cast of the medal is first obtained, either in fusible type or metal; and by the third, we make the intaglio cast in some non-conducting substance, as white wax, sealing wax, &c.

To take a primary cast at once from the medal or coin should not be attempted by an inexperienced hand, and never by any one from an unique specimen, for fear of any mischance. The process, however, is simple and very valuable, when we desire a very perfect intaglio impression of any coin or medal. The object to be copied is to be coated on the side where we no not require the action to take place, with grease, wax, varnish, or other non-conducting substance. A very fine wire is to be passed round the rim, and then it is ready to be placed in the metallic solution. The adhesion of the air to the metal is of considerable importance in this case, and the metal should not be allowed to remain a single instant in the solution before the galvanic circuit is completed.

The obverse and reverse can be copied by two operations, or even both by one, taking care to grease the rim, so that the whole medal may not be confined by the new deposit. This operation gives us two moulds, one of either side the coin or medal in intaglio. By this process a copper medal or coin is liable to have its bronze removed, but a gold or silver one will not suffer the slightest injury. This mould may be used for making plaster casts, sealing-wax impressions, or it may itself be again used as a mould to receive the galvanic precipitate, and we may thus obtain a very perfect relievo copy of the original. Intaglios may be taken off coins or medals in lead, pewter, fusible type, tin foil or silver leaf, and these intaglios are then to have a coin soldered or placed in connection with them, when they will be ready for the reception of the metallic precipitation.

The third method, however, is the one which should be generally adopted; for, by non-conducting substances we can obtain most excellent moulds for receiving the precipitation. For coins, very small medals, and cameos, impressions in good sealing-wax are to be preferred by the AMATEUR. These must have a fine wire melted into the wax, and be blackleaded, and then they are ready to be copied.

Larger medals may be copied in wax, bees' wax and rosin, or plaster of Paris. The plaster of Paris must be rendered non-absorbent by any of the processes detailed in Mr. Smee's valuable work. Tallow

* *Smee's Elements of Electro-metallurgy.*

or spermaceti are best adapted, and from their being always at hand are to be preferred. They are then to be blackleaded, when they may be placed in the solution. By either mode perfectly sharp medals may be obtained.

To the workman who requires to make a large number of metallic impressions of coins, I would recommend the use of a square piece of plaster of any convenient size, say six inches each way, with impressions of medals as thick as he can put them. This might be easily managed by joining separate plaster moulds together till the size is obtained. This piece must be filled by the processes given before, blackleaded, and lastly, the metal thrown down upon it.

IMPROVEMENTS IN MANUFACTURING BEET-ROOT SUGAR.*

The quantity of sugar extracted from beet-root in the commencement of the process, amounted only to two per cent.; but it was afterwards made to yield five per cent.; and it was supposed possible to extract six per cent. On this calculation, the fiscal regulations for the protection of colonial sugars in France were founded; but recent experiments have been made, by means of which as much as ten and a half per cent. of sugar has been obtained. The following notice of the improved process is given in a recent number of the *Constitutionnel*:—

"It appears that a great improvement is likely to be made in the manufacture of beet-root sugar. Those who are acquainted with the process of this manufacture, are aware that M. de Dombasle has for the last six years exclusively devoted himself to bring to perfection the process of maceration, of which he is the inventor. Adopting recent improvements, this process is materially altered, and has now arrived at such a point of perfection that it could scarcely be exceeded. The society for the encouragement of national industry, in November last, appointed committees to examine the effect produced in the manufactory of Roville. They witnessed the entire progress of the work, every part of which was subjected to minute investigation. Similar experiments have been made in the presence of many distinguished manufacturers.

"We have not the least intention to prejudge the decision which may be made on this subject by the society we have alluded to; but we believe we are able to mention the principal results that have regularly attended the works of the manufactory during the year. The produce in coarse sugar has been more than eight per cent. of the first quality, and more than two per cent. of the second quality, in all nearly ten and a half per cent. of the weight of the beet-root used; and the quality of these sugars has been considered by all the manufacturers superior to anything of the kind that has hitherto been made, and admits of its being converted into loaf-sugar of the first quality. The progress of these operations is as simple as possible, and the expenses attending the manufacture are considerably less than that of the process hitherto adopted."

* *Inventors' Advocate*, No. 81.

APPLICATION OF ELECTRO-METALLURGY TO NUMISMATICS.†

BY ALFRED SMEE, ESQ.

At the meeting of The Numismatic Society, on the 21st of January, Mr. Alfred Smee delivered a lecture on the Application of Electro-Metallurgy, to the purposes of the numismatist.

He commenced by explaining the principle of metallic precipitations by galvanism, which he illustrated by a piece of zinc and silver, the latter becoming coated with copper when the two were immersed in a solution of that metal. The metals and carbon were then adverted to as capable of being employed instead of silver.

The apparatus to be practically used by the numismatist, he divided into two kinds —the single cell, and the battery apparatus. In the first, the arrangement of the zinc and medal to be copied are similar to the constant battery. The battery apparatus is composed of two distinct parts, a galvanic battery and a precipitating trough.

In the trough a plate of copper is placed to be dissolved, in a solution containing two-thirds of saturated solution of sulphate of copper to one-third of dilute acid, containing one part of acid to eight of water; but Mr. Smee stated that any solution would suffice, as he could obtain copper of any quality.

He then drew attention to the various modes by which Electro-Medallions might be made. By the first, a mould was taken directly by Galvanic precipitation; but he recommended that this should never be attempted with valuable coins or medals. He next mentioned silver leaf, tin foil, fusible metal, type metal, semi-fluid pewter, lead, &c. as capable of being used, but he stated that all these processes were, more or less, objectionable.

The processes for making moulds from non-conducting substances, were next described; stearine, white wax, bees' wax, and resin, sealing wax, &c. were mentioned, as answering for the purpose of moulds.

† From *The Athenæum*.

The latter was recommended for small coins and medals not larger than half-a-crown. All these different moulds required preparation, that is, they must be coated with some conducting substance before they are placed in the metallic solution. Mr. Smee prefers plumbago, and he dwelt upon the different qualities of that material. The last non-conducting substance mentioned was plaster of Paris.

After the mould was made, it required to be saturated with tallow, stearine, spermaceti, white wax, &c. The process was shown at the lecture, by boiling a small plaster cast in tallow; after this preparation the cast is black-leaded, and then it is ready to receive the metallic precipitation. Medals made by this process were exhibited to the Society; they were bronzed by a process devised by Mr. Smee. He then gave a brief sketch of other applications of Electro-Metallurgy, and exhibited electro-coppered baskets, fruit, leaves, and vegetables.

At the conclusion an electrotype copper-plate weighing fourteen pounds, made by Mr. E. Palmer from an original by Burnett, was exhibited to the Society, and the impressions of both the original and duplicate were shown, and no difference could be detected between them.

GALVANISED METALS.

M. Sorel has succeeded, by means of a constant electro-current, in fixing upon iron in the cold state a more or less thick and very adherent layer of zinc; and in the same way he has been enabled to fix several other metals.

M. Perrot, of Rouen, has been engaged with experiments upon the same subject.—*Athenæum.*

MODE OF PURIFYING WATER.

It is well known that animal charcoal possesses the property of withdrawing certain salts from their solution in water. M. Girardin, of Rouen, was lately consulted in a case where water kept in a new cistern became tainted by dissolving a portion of lime and cement; Girardin ordered about 24 lb. of ivory black, or animal charcoal, to be thrown into the cistern; in fifteen days the water contained no lime in solution, and since that time the water has been excellent.—*Ibid.*

NEW INDELIBLE INK.*

M. Bezanger has sent to the French Academy of Sciences a description of a new economical ink, for which he has taken out a patent. It consists of lamp-black mixed with caustic soda, and gelatine and caustic soda. By adding an aromatic gum to this ink, it is difficult to distinguish it from Chinese ink, its qualities being the same, alkaline and indelible, but its cost much less.

* *Moniteur Industriel.*

III. PHARMACY, &c.

MEETING OF CHEMISTS. — PREVENTION OF CHEMISTS FROM PRESCRIBING.

We take the earliest opportunity of laying before our readers a Report of the proceedings at the meeting, held at the Crown and Anchor, on Monday, the 15th ult. convened by advertisement, to take into consideration certain clauses of Mr. Hawes's Bill for the better regulation of the medical profession—that Bill being appointed for second reading on the 19th. The meeting was most respectably and numerously attended. Mr. Gifford was unanimously called to the chair.

The Chairman, having read a letter from William Allen, Esq., F.R.S., regretting the inability of his attendance on account of a previous engagement, stated that the meeting was called together to consider the important bill of Mr. Hawes, by which the interests of every chemist and druggist in the kingdom were materially involved. He then proceeded to notice the various clauses relating to the trade, which provided for the establishment of a medical senate, who should examine with respect to their qualifications, and grant licences and diplomas to all such persons who should, after the passing of the act, enter upon the business of a chemist and druggist. It also prohibited all such from prescribing or giving medical advice or performing any surgical operation, except those who had received licences as medical practitioners; and attached fines and penalties to those so offending. Persons actually in trade before the passing of the act, their assistants and apprentices, might, however, obtain licences to carry on the business without passing any examination. Such were the clauses which principally referred to their interests, and he left them in their hands for consideration.

Mr. Bell, of Oxford-street, moved the first resolution, to the effect that the provisions of the act were very obnoxious to the interests of the trade, would materially affect the comforts and resources of the poorer classes of society, whilst the facility which it afforded for laying informations would give rise to unceasing vexations. He contended that were the act to pass it would materially injure the profession, and elevate apothecaries at their expense. It ought to be left to the public to decide whether they would go to the physician or apothecary, or be content with the aid of the chemist and druggist. The act contemplated an unnecessary interference in the concerns of those who had always well managed their own affairs.

Mr. Keating, of St. Paul's Churchyard, seconded the resolution. The act of Mr. Hawes, if carried out, would prevent a chemist from interference even in the case of a person who had taken poison, and where he knew that a timely remedy would prove effectual. Besides, who was there constantly at home to attend to the wants of the poor, but the chemist or his assistants, who were always at hand, whilst the pursuits of the apothecary led him from home a great portion of his time?

Mr. Cooper, who was announced as attending the meeting on behalf of Mr. Hawes, in order to explain any parts of his bill, stated that he attended as an act of courtesy on the part of that gentleman, in order to satisfy them upon any point on which they might require information. He felt that a body like that of the chemists and druggists should not be neglected, for, that like medical men, their interests were identical with the public good. He thought that he should be able to prove that the bill would confer a great boon—(laughter and uproar). There was only one point to which they could object, and it was that which restricted them in prescribing for patients. They were not only placed on the same footing as before, but they would be more embodied; they would be protected in their trade from other parties who were not qualified to carry it on, and they would be freed from many parochial duties and other offices from which the members of other trades were not exempt —(hisses.) He could assure the meeting that Mr. Hawes had consulted persons connected with the trade, and that he would readily attend to any suggestions which might be thrown out. He was not connected with any medical association, but it was a lay bill of his own, and he knew that he did not wish to upset any one branch of the profession for the benefit of another, nor would he throw aside the opinions, if he were compelled to reject the wishes, of any body of men. The only point on which they were at issue was, he conceived, as to how far a properly educated chemist and druggist should have the power to prescribe; and he considered it necessary that persons should be at least competent to the duty which they undertook. With that exception their business would remain as it now was. He would admit that surgeons ought not to be permitted to sell drugs, and he would be glad if any body of men could force that profession into a state of more respectability. This was a question, however, of practicability, but he hoped that the day was not far distant when it would be adopted. It might be possible so to frame the bill as to make it all the trade could wish; and if they differed on some points, others might be extended to meet their wishes.

Mr. Barry asked if Mr. Hawes would postpone the second reading of the bill for a month, in order to allow time for its full deliberation?

Mr. Cooper said it would be impossible for him to pledge himself to that. It was not, however, necessary to oppose it at the second reading, for it would be in sufficient time to do so in the committee, when the bill was considered in its details, and when it would be read clause by clause.

Mr. Barry expressed his disappointment that it was intended thus to hurry the bill forward. The intention of the act was that the druggists should be registered by their rivals, and time ought to be given for petitions from the country and the public, who were equally interested. Let surgeons continue to sell drugs, as they are their rivals, but let not so tyrannical a measure be passed as would inevitably sacrifice the chemists and druggists to the apothecaries. They ought to unite in their own defence, as the bill was not founded upon equitable principles.

Mr. Payne, as a member of the Apothecaries' Company, advised the meeting to attack the bill at the threshold of the door. If they were not allowed to prescribe it would be necessary for them to shut up their shops—(hear). Look at the druggists' shops in poor neighbourhoods, and see the advantage which they conferred. They were the physicians to the poor, and by the facility which they afforded for aid, disease was often stayed in its infancy. No legislative interference could point out where the line of demarcation should be drawn, but they should leave it to the public to judge for themselves, in whom they could repose their confidence. He would venture to assert that no druggist would risk his reputation by going further than he ought in giving his advice—(hear).

Several gentlemen having spoken upon

the resolution, it was ultimately agreed to.

The next resolution, which was carried, was to the effect that Mr. Hawes, the proposer of the bill, should be requested to defer its second reading for a month. Resolutions declaratory of the hostility of the meeting to the clause for preventing chemists and druggists prescribing, and that the attention of the trade should be drawn to the subject by advertisements in the daily papers, were also agreed to. Mr. Pigeon, treasurer to Guy's Hospital, was appointed treasurer, and a committee was formed, composed of representatives of the leading wholesale houses, and the leading retail chemists of the metropolis.

In the course of a long meeting it was admitted by most of the speakers that some of the plans of Mr. Hawes, for improving the education and qualifications of members of the trade, might be advantageously introduced.

The present attempt at preventing chemists and druggists from prescribing is what was urged on the passing of the Apothecaries' Act, which came into operation in 1815, but which was renounced on account of the strong opposition raised against it. A superfluous fund remains in the hands of the trustees, which, it is believed, may be available to the purposes of this association.

A very liberal subscription was entered into, and a strong appeal will be directed to the trade.

The following is a copy of the resolutions passed at the meeting:—

Moved by Mr. Bell, seconded by Mr. Keating, and resolved,—

"That the provisions of this Bill deeply injure the interests and lessen the usefulness of Chemists and Druggists, as well as affect the comforts and resources of the poorer classes of society, whilst the immediate and pressing wants of individuals would create a liability to informations, the which would be a source of unceasing vexation."

Moved by Mr. Barry, seconded by Mr. Farmar, and resolved,—

"That it is the opinion of this Meeting, that Benjamin Hawes, as author of this Bill, intituled "A Bill to amend the Laws relating to the Medical Profession in Great Britain and Ireland," should be requested to defer for One Month the Second Reading, to enable the Public and all Parties interested to form their opinion upon its merits."

Moved by Mr. Walker, seconded by Mr. Ince, and resolved,—

"That Petitions be immediately presented to Parliament against Mr. Hawes's Bill, especially against that Clause depriving Chemists and Druggists of their right to prescribe and recommend medicines."

Moved by Mr. Wilkinson, seconded by Mr. Mayhew, and resolved,—

"That the following be a Committee, with power to add to their number, for the purpose of watching and opposing the progress of this Bill, viz.:—

William Allen, F.R.S.	Thomas Herring.
Joseph Gifford.	Thomas Walker.
Jacob Bell.	Thomas Keating.
Charles Dinneford.	Edward Winstanley.
John Toller.	George Waugh.
Joseph Smith.	Thomas Butler.
Richard Battley.	Samuel M. Mayhew.
John T. Barry.	Robert Farmar.
John Ellis.	Samuel De Castro.
Samuel Foulger.	Samuel Green.
William Lowe.	Edward Simkin.
Charles Davy.	William Ince.
Edward Horner.	Edwin Briggs.
Richard H. Pigeon.	George Baxter.
Thrower Herring.	J. S. Lescher.
Charles Barron.	G. W. Smith.*

Moved by Mr. Dinneford, seconded by Mr. Austin, and resolved,—

"That R. H. Pigeon, be appointed Treasurer, and Subscriptions solicited from all the Chemists and Druggists of the United Kingdom."

Moved by Mr. Keating, seconded by Mr. Watts, and resolved,—

"That a Copy of these proceedings be printed, and sent to every Member of the Drug Trade in Town and Country, and also be published in the Newspapers."

Moved by Mr. Herring, seconded by Mr. Farmar, and resolved,—

"That the best thanks of this Meeting be given to the Chairman, for the efficient performance of his duties."

In commenting on the results of this meeting, we feel bound to call the attention of our readers to our constant and vigilant advocacy of their rights, even from the first

* The name of Mr. Ralph Stamper has since been added.

number of this Journal, which was established in order to form a record of all discoveries and improvements within the period of publication, in CHEMISTRY, CHEMICAL MANUFACTURES, and PHARMACY, and to be the medium of communication through which they might, at all times, be enabled to increase their knowledge, to protect their interests, and improve the condition of their branch of the profession; and thus defend themselves against the perpetual and unfair encroachments and aggressions of general practitioners, who, both privately and publicly, are constantly seeking to oppress them and detract from their rights, with every advantage of effecting their objects through the medium of a work peculiarly addressed to them.

Under these circumstances, it is quite evident that general practitioners possessed the advantage of a channel of publicity through which to advance their own interests and keep up a perpetual distrust and outcry against Chemists. It was necessary, therefore, that there should be established a Journal that would give to the latter similar advantages, by supplying a continued source of improvement in knowledge, and likewise preventing the total destruction of their business. This want of a medium of public communication, has long been felt, and our labors, in THE CHEMIST, to supply it, have been received with an unqualified approbation of our readers and contemporaries which we shall study to preserve.

Long have the Apothecaries* had an organ through the medium of which they have constantly kept up a running fire against Chemists and Druggists exercising that power, which we defy them or any acts of the Legislature to prevent; for to render aid in immediate distress of any kind is the birthright of every human being,—

"Man to man must bring relief."

And we are satisfied, that in cases of temporary urgency, they have shewn as much regard to the safety, and, considering their education, displayed an equal degree of intelligence where they have ventured to interpose their sudden and promptly needed advice and assistance, as those by whom they are denounced, in THE LANCET, as "ignorant chemists and druggists, and illiterate pretenders and impostors."†

Now we have had the most extensive experience of the degree of knowledge possessed by the general practitioners, and we regret to say that it has always been of the most limited and smattering kind; their prescriptions evidence a despicable ignorance of Pathology, Chemistry, and Materia Medica, and are in every respect lamentably destitute of literary accomplishment.

We too plainly foresaw the difficulty which any member of the Legislature would have to encounter, in his attempt on this subject; and regarded his undertaking as one of a most unenviable character: there is, however, this consolation,—that, so far as founded on reason and justice, he would find equable measures of medical reform meet the most cordial approbation and support of all respectable chemists; who, though courageous enough to resist any attempts instigated by the "Gallipots" to destroy their business, are anxiously desirous to qualify themselves, and undergo the ordeal of examination. It is now quite clear that the all-important and difficult question, of allowing or preventing chemists from advising among the poor, and in pressing and urgent cases, would be set at rest by this creditable resolution; for, as it is impossible to prevent them by any acts of Parliament,—and, indeed, the withdrawal of the clauses of the bill attempting it, evinces that it is,—the liberal and emulous spirit exhibited by them meets the case in the only and best way, namely, by acquiring the knowledge by which they will be enabled to exercise, WITH proper qualification, that right which they now possess, and no power can obstruct their employing WITHOUT.

* Such, only, are ninety-nine out of every hundred, however sore they may feel at the appellation, and prefix the stolen title of "Surgeon" to get rid of it. We think there is greater need for reform here, than in any practices of chemists.

† Of course, it is to be taken for granted, that that branch which is particularly advocated therein, is an example of learning and science, if the getting by heart the interlinear translation of the first four books of Celsus constitutes the one, and the mistaking the gracilis muscle for the great sciatic nerve does the other, as we have seen.

Now comes the enquiry, who are to be their teachers and examiners? and at what school are they to be taught? Is the College of Physicians, or Society of Apothecaries to have this charge? Are they to have this power over them,—they, their oppressors and opponents? Is the power of exclusion to be vested with them, wherever their interests and petty feelings are called into action? From such hands as either, God deliver them! Infinitely better would it be to allow the attempted restriction to pass into a law, than to deliver them into the clutches of these parties: nay, the very intention of the rejected clauses is quite enough to convince us of the *good offices* of the apothecary, who, of course, caused their introduction, and offers palpable evidence of the tender mercies they would have to expect if placed under them in this respect: these parties would indeed gain their end by the exercise of their privilege—rejection and partiality against which we by no means think them proof—with the most perfect and stringent rigor as if any law to restrict their giving advice had been passed.

Little need is there of any fear that teachers of equal merit, and a method of teaching of much greater value than any now adopted, will soon spring up among Chemists and Druggists; for, bad indeed must be their condition as regards knowledge, if they are compelled to seek teachers from the ranks of general practitioners.

We are bound also to advise them to offer opposition to any increased power in the medical corporate bodies. We shall neglect no means of offering our protest against the slightest increase of power and advantages being given to them in any acts introduced into parliament. Urgently do we advise them to pursue this course; and are sure that they will soon outstrip their opponents in usefulness, especially to the poor; if they do not equal them in the acquisition of wealth. To attain a respectable standing in the profession, and remove distrust and obloquy, it is indispensable that the pupils, apprentices, and assistants of chemists and druggists should be required to obtain a competent knowledge of chemistry, botany, materia medica, and pharmacy; which will give them the necessary acquaintance with the laws of chemistry and chemical agents, and the nature and properties of the plants and other substances employed in the restoration of health: they will no longer be stigmatized as mere automatons, dealing in articles of whose uses they are ignorant.

We are authorised to announce their wish and desire to obtain a suitable education, and undergo a corresponding examination, calculated to enhance their respectability, and thus flinging in the face of their maligners the odium cast upon them, to insure the confidence of the public, and quite as much to deserve it as any class of the profession, of which, many of them are now distinguished ornaments. This voluntary declaration of a desire for knowledge evinces a spirit which we could wish to see in other ranks of practitioners, now infinitely more ambitious of profit, than distinction in science. Highly necessary is it for them to acquire sufficient knowledge to render assistance, without the risk of injury to the public, or the endurance of professional insult.

We now come to mark the very mild tone exhibited by *The Lancet* upon the result of this meeting, so smooth compared with the inflammatory character it usually assumes, that we are led to fear, and caution our readers against supineness, lest they may be surprised on a sudden, and find that the embers have been only smouldering, not extinguished, and are ready to blaze forth in a moment.

With ceaseless vigilance therefore do we urge them to guard their interests: we distrust the new Bills about to be introduced into parliament by Mr. Warburton and Mr. Wakley; for it is easy to see, that although Mr. Hawes has consented to withdraw the clauses from his bill which related to chemists, others are more likely to introduce such enactments as, though they do not interfere, in the same way with them, will have the effect of giving such advantages to apothecaries, as may at once prove the destruction of the interests and rights of chemists; for we are perfectly satisfied that medical reform is a mere blind, and that the real objects sought to be obtained are nothing but a still further infringement on the rights which peculiarly belong to chemists and others of the profession, already sufficiently injured by their innovations and

encroachments. Any reform of medical practice entrusted to the existing corporate bodies will be worse than the Cardigan farce: all the paraphernalia of justice will be displayed in order to make the mockery of it appear the more evident.

ADULTERATION OF DRUGS.

BY CHARLES WATT.

From the labor we have bestowed, and are resolved to continue, on the important subject of adulteration of drugs, we are in no expectation of receiving the smallest benefit, other than that which may result from the exposure of such infamous atrocities as have so long been suffered to go unchecked and unpunished, and have excited no more care on the part of the body,* bound to watch over these affairs, than they have from the Legislature, equally bound in duty to protect the public and fair dealer by laws framed to punish those who are guilty of such heartless ingratitude and villany.—Our duty to the public demands that we seize every opportunity to prevent injury and render benefit; these are our only aims, and their attainment our best reward; and we are not without a well-founded hope, that if we do not accomplish *all* that we could wish on this subject, we shall, at least, arouse public attention to it. If we fail in making men honest, we may nevertheless have the satisfaction of promoting their detection and insuring their punishment. It may, we will admit, become apparent, that that much is left undone; we trust, however, that it will be equally manifest that much likewise is performed; and we are not to be deterred from attempting to do good, because we are unable to reach perfection.

In the course of our inquiries and search for information on this head, we have brought to light a catalogue of depravity that cannot fail to fill our readers with equal surprise and disgust, at practices as disgraceful and cruel as ever stigmatised a community, even of the lowest grade in civilization.

The accounts we have at times already given in THE CHEMIST, form not a tithe of what has since been furnished to us from every quarter of the United Kingdom. The nefarious frauds and cheats which are practised in drugs—not on a few merely, but on every one which is employed for the restoration of health—exceeds all description or belief. Some who are desirous that the present state of things should be continued, may wish that we would relinquish our purpose; but we know that by every house of character and respectability, our labors are appreciated, and are held as productive of much good to the public, and those dealers who are above the commission of fraud. We have received the thanks of many, and are solicited to continue our course. Independently of the injury to the public, what is the effect produced on the honorable and fair dealer—on the upright man, who will not soil his mind, nor debase the reputation of his house by such conduct? He of course cannot afford to let goods of a genuine quality go for prices at which adulterated ones are sold; hence he is greatly injured by the public dealing with parties who can undersell only because they keep and deal in spurious articles. The advantages these wretches possess will be easily understood by the following anecdote:—

A gentleman having been in the habit of having dispensed at one shop a box of pills, for which he paid only one shilling, happened to take the prescription to another, at which he was charged four and sixpence. Surprised at this charge, he paid it with great anger; upon which the chemist requested, and he agreed, to go to the Apothecaries' Hall to ascertain the regular price. On enquiry there he was informed that one of the articles—James's Powder—would cost three shillings and threepence of the money. At this he was so satisfied that he returned and made every acknowledgment to the chemist. Our readers will readily judge, that for James's Powder the first person had substituted the antimonial powder, which, it is universally admitted, is in no way equal to the true preparation, for physicians write for it thus:—"Pulv. Jacobi verus."

It is with no small surprise we reflect on the length of time these abominations have been allowed to go on, without any one member of either House of Parliament interfering to prevent them. That they should never have excited any member of the profession whose duty it is to correct all abuses, is no matter of wonder. This Body has long been regardless of its original intentions; with them it appears as if

* The College of Physicians are empowered to send their censors to visit shops and inspect drugs; but who ever heard of their performing this duty? And, from what has of late come to our knowledge, we much doubt their qualification to perform it if they undertook it. The whole Augean stable of these corporate bodies wants clearing out from one end of the profession to the other. Can any good arise from a corporation compounded of such elements? They must be dissolved, for they are worthless.

they were actuated by the motto—
'Labitur et labetur in omne volubilis ævum.'

From the period of our first number, to the present time, we have called public attention to it, and it is only since we have pursued the subject that any notice has been taken of it. It is now, however, before the public, and we doubt not that good will result from these exertions. It may here be asked—why not memorialize, or lay the matter before, the Government? To this we reply, that we should have but little faith in any success from such a course; and as little will our readers, when they peruse the following statement of the manner in which the stores for the service of our brave army and navy are supplied; and it furnishes another palpable instance of pandering to popular opinion, by the apparent study of economy, to the sacrifice of those who have bled in the cause of their country, and to whom Britain owes her greatness, and Europe its tranquillity; and to whom they must again trust in the hour of danger. Of all men, they deserve especial care in illness or accident—the heritage of their profession, and the disease that awaits their hazardous perils. Infamous indeed is that parsimony which is shown in so sacred a trust, while thousands are lavished in berths and sinecures, to pamper with voluptuousness and luxury imbecile striplings, the "lilies that toil not, neither do they spin."

Little, we repeat, is to be expected from this government, by way of correction of the base practice of adulteration, and the public will perfectly agree with us in this view of the case, from the following details which have come to our knowledge from the most authentic source, and we are ready, if called upon, to substantiate the facts, before any authority. The contracts for supplying the medical stores of the army and navy, until of late, were always given to Apothecaries' Hall; they are now, however, taken away from that establishment and given to a private channel, merely because the estimate was lower than that of the Hall. The orders of the authority who rules in that department were "to take the *lowest* tender;" and upon being asked if samples were to be sent, the order was repeated—to take the lowest tender, and no mention of samples was made. On another occasion one of the medical board was asked by a principal and respectable house to inspect some samples, and gave for an answer that if he did he could never get through his business. Indeed we have never heard before this time that medical boards were so over worked, but we have often heard of their being overpaid and doing little. We suspect that two better reasons than the doctor advanced, made him decline the task—the one the trouble of the duty—and the other his ignorance of the subject. He has one consolation, that is, he is in no danger from this ministry in losing his ample salary, or rather sinecure, as the preceding statement evinces; and no doubt the doctor is happier without the trouble, and quite as much so without the knowledge; therefore—

"Where ignorance is bliss 'tis folly to be wise."

To attempt reform here would be insane, the whole squad ought to be sent to the right about, and their departure accompanied by the rogue's march.

To particularize every article of adulteration, would be in fact to give a list of all the substances in the Pharmacopœia. Such instances as have come to our knowledge at present,—and they are indeed FRIGHTFULLY NUMEROUS,—will suffice to shew the lamentable state of the laws on this subject, and the infamous conduct of those whose duty it is to provide against these practices. Public attention is aroused to the subject, and if we may judge from past experience, publicity of these frauds and exposure of their perpetrations, will be the most effectual remedies.

We shall, however, detail a few instances in order to satisfy our readers on the subject, and to shew the urgent necessity of the power of punishing offenders in these respects being demanded.

Our readers are well aware of the source whence is obtained the genuine sulphate of quinine, viz. from M. Pelletier. The method of adulterating this is by various inferior and costless articles, as with magnesia, and even sulphate of lime. Pelletier's labels are copied and can be procured at a few pence per dozen: these are pasted on the bottles, and this spurious compound is sold as the pure sulphate.*

Even in the common article of blue pill, we find that the conserve of roses is omitted, and that the mercury is in very small quantity; while the color is imitated by the addition of coloring matter.

In the article of scammony, the basest practices exist. The merchants here order it to be sent over by the parties abroad, adulterated so much per cent., the amount of it being directed according to the conscience of the merchant—never over scrupulous.

Jalap is mixed with various inferior or damaged sorts, and also with Linseed meal. Turkey rhubarb at sixteen shillings per pound, is largely mixed with British, at one shilling per pound, or this latter is wholly substituted for it. English oil of lavender at thirty-six shillings per pound, is mixed with American at sixteen shillings, or this is sold for it. These frauds are by no means confined to

* See *The Chemist*, vol. I. p. 94.

retail dealers; they are largely practised by wholesale houses; but they shall not long remain in their hiding places: to the public scorn will we, in due time, consign them.

We rejoice that our labors to devise some means of analyzing and detecting these frauds, sufficiently accurate for all practical purposes, have not been in vain, and we shall unremittingly carry them out against their authors by holding them up to public detestation, and using every effort to secure their punishment. Our utmost vigilance, watching over the course taken by the legislature on this important subject will rigorously be employed, and our readers will, from time to time, be made acquainted with every matter which may be worth communication.

It now remains to state the remedies we propose to adopt in order to remove these abuses, and the punishments to be inflicted on their authors. These are the same as we proposed in the advertisement of our first number, namely, the appointment of a Board of Commissioners, not members of the College of Physicians, nor of the Apothecaries' Company,—for these have too long shewn their negligence, and demerit of public confidence, in their failure to perform the duty, and we can add our thorough conviction of their want also of knowledge,—but of persons selected from among those whose skill in the nature and qualities of drugs, is known and proved to have been acquired by constant practice and ample experience in them; and not favourites put in merely to provide them with places, which interest and good fortune alone make easily accessible to them.

It should be the duty of these commissioners to inspect all shops, and condemn all bad drugs, and summon the party keeping them before such authority as, upon conviction, is clothed with the power of inflicting fine and imprisonment. The urgent necessity of such a course is most amply proved by the recent case brought before Mr. Alderman Pirie, by Mr. Foster, of New City Chambers, in which it was proved that the medicine chest of an African captain contained no one article of even decent pretension to the quality of the substance its label denoted. Should this diabolical practice be allowed to continue? Ought not proper persons to be appointed to visit the low shops and inspect the drugs and medicine chests of those parties supplying them? We see written up on the boards of some of these men—"Medicine chests fitted up!" fitted up indeed!! Let only any competent person go the round among the many meagre and dimly lighted shops in the bright regions of Wapping, Shadwell, East Smithfield and Ratcliffe Highway, and he will then indeed be satisfied of the infamous cheatery and impositions practised by these men, upon the seafaring part of the community. We know them well, and they shall not continue in their traffic without the finger of public scorn being pointed at them. Our frequent visits to Liverpool, Bristol, Portsmouth, &c. &c. enable us to state that the like is practised to an extent, even greater, if possible, in those parts.

The foregoing remarks on this subject must for the present suffice: we doubt not they will convince our readers of the direful prevalence of fraud, so injurious to society, and destructive to the upright and honorable dealer, and so detrimental to the credit of the trade; and that our observations have not been uncalled for, or irrelevant, made as they have been under the firmest conviction that we cannot more faithfully conserve the interests, nor promote the benefit of it, than by advocating its integrity and correcting its abuses.

We may, and doubtless we shall, incur the virulence of those who are affected by our attention to this subject; but our duty to society demands of us utterly to disregard their opinion. We shall continue our utmost efforts to suppress, if we cannot wholly prevent, these criminal proceedings; and whatever may take place from obloquy and aversion from such a quarter, we shall obey the motto,—"GO FORTH AND FEAR NOT!"

ON THE ADULTERATION OF DRUGS.

To the Editors of The Chemist.

GENTLEMEN,—It is with very great pleasure and satisfaction that I observe your strenuous exertions to bring to light the gross adulterations, to which many of our most valuable medicines are subjected. I am truly sorry to think how common this abusive practice has of late years become, for even our most useful condiments in daily use suffer under the hands of the evil disposed. It is my intention at present, to throw out a few general hints on this system, and I shall in all probability at some future period return to it in particular.

It pains me, Gentlemen, to see the once respectable trade of Chemist and Druggist so much on the wane; but I cannot help remarking, that the very members of that profession, whose duty it ought to be, to support the dignity of their trade, to the utmost of their power, should be the persons who have for some time, and are still engaged, in bringing it to ruin. If men would only reflect, they would at once see, that they are acting in direct opposition to their own interests. Adulterations appear to me to be of two descriptions, and which I will term WHOLESALE and RETAIL; and

here many may suppose that I ought to enter upon the merits of the question, which has been so often discussed,—namely, whether the London wholesale house or the retail vendor of medicine is the party at fault. Both certainly are to blame; for I would ask, why the wholesale dealers should be able to offer Scammony (as an instance) at five or six different prices? Yet the fact is notorious, that many London houses will offer you this drug at 20*s.*, 24*s.*, 26*s.*, 30*s.*, and even 36*s.* per pound. Now, what are we to think of the quality of the lowest priced Scammony, or of its effects on the constitution? And this is but a solitary instance, for there are numbers of people who will sell you drugs at half a dozen different prices, and tell you that their articles are ALL GOOD and GENUINE.

Take for a moment into consideration, the object and use to which drugs generally are subservient; think of the peculiar effects expected to be derived from minute portions of those substances, and then enquire, what must be the character of that man, who can so trifle with the best feelings of our nature, by giving what he knows to be comparatively inert, for the mere purpose of saving a few paltry pence. But if the house from which those spurious drugs emanate is to be reprobated for its conduct, how much more necessary is it that dispensing chemists should be careful in the selection of their drugs. For my own part, I do conscientiously think that few respectable wholesale druggists will knowingly send out bad medicines, provided a good price be given. But then there are so many sources of opposition, so much to convince and overcome, ere they can obtain a fair price for good drugs, that (with shame be it spoken) they are sometimes driven by necessity to keep and vend comparatively inert trash, in order to *oblige their customers.*

I am the more disposed to believe this, when we observe the path followed by retail chemists at the present time, and we have every reason to believe that within the walls of the laboratory drugs are mixed with extraneous matter, or what is facetiously termed *improved.* As some foundation for this idea, allow me to bring forward one or two facts, which I think, Gentlemen, you will admit, militate not a little against the chemist.

A *respectable* druggist in the country is just now selling mercurial ointment for 1*s.* 10*d.* per pound, the lowest market price in London being 3*s.* per pound. Ground black pepper is sold in this city at 10*d.* and 11*d.* while the berries bought in large quantities by the bag are worth 1*s.* and 1*s.* 1*d.* in town.

But is it not also monstrous, that in this town there are druggists, who have their windows placarded with intimations that the best seidlitz powders, are to be had for *eight-pence* per dozen,—nay, do we not observe the public newspapers, a receptacle for such announcements? Now the mere cost of *proper* ingredients would come to this money independent of various concomitant expenses. In these rascally modes of proceeding some ingenuity, worthy of a better cause, is displayed. In the first instance, the blue ointment is reduced with *lard* colored with Prussian blue. The pepper is mixed while grinding with linseed meal, or what is technically termed P. P, which, to be understood, is the powder of an inert and useless body, worth 2*d.* or 3*d.* per pound. The seidlitz powders are almost entirely composed of bruised glauber salts, to which is added the quantity of carbonate of soda, and two or three drops of oil of lemons.

Upon a perusal of the powders, it is not an unfrequent circumstance to be able to pick out a crystal of the sulphate of soda,—while, if sufficiently bruised, the color, when compared with that of a genuine powder, will at once be found black and dirty. But we we have the cheap powders eulogised by the highly pleasing intimation of being "Lemon flavored,"—true "Lemon Seidlitz Powders:" thus they get rid in a great measure of the nauseous taste which would and does predominate,—so much so, that many are unable to swallow the draught, while with others a disagreeable drastic effect is the consequence. I was very much amused two or three days ago. Having occasion to pass along one of the most obscure streets of our city, bearing somewhat a comparative analogy to the St. Giles of London, to see tickets in more than one of the paltry gin shops, boldly intimating,—"here was to be had best Lemon Seidlitz Powders one penny each, or twelve for eightpence." So much for the far-famed Seidlitz Powders. I cannot conceive why a druggist should for a moment attempt to gain the better of his brethren by producing an inferior article, with the cognomen of best, and sell it at an inferior rate. It resembles a man rolling up some part of a dress, and marking it "finest and most superb," while it is either in perfect tatters, or made from the most common material. But we here have exemplified the evil of bad conduct. No sooner does one man appear to dispose of a quantity of one article rendered impure by this nefarious plan of mixing, than another follows his bad example by imitating him; and thus the public, a little at a loss, and staggered by low prices, become their patrons, until having practically felt the baneful effects of cheap medicines, they leave them in disgust. But although there is thus a remedy carried along with

the evil,—we cannot so easily discover a cure for adulteration in some of the more particular substances. Thus I have been told, on undoubted authority of a Chemist vending the P. Antimonialis, for true James' Powder, and charging one penny per grain, and from the same source, that Tinct. Opii is adulterated with burnt sugar. I am sorry to say that this latter instance of adulteration is followed by many, as was proved by Professor Christison of this University, who, about two years ago, published a paper in the Edinburgh Medical and Surgical Journal, wherein he stated the result of his analyses upon several quantities of Tinct. Opii, derived from various shops in this place, and by which he proved, that sugar was found in many of them.

I may be considered as severe against retail Chemists generally, but I can assure you, Gentlemen, that I can give localities and names for every statement I have made in this letter. There are several additional circumstances which I could here adduce, but which I consider to be unnecessary.

There is also another source of fallacy, both as regards the wholesale and retail drug venders, which ought not to be passed over in silence. There are many articles in our Materia Medica which spoil by long keeping, such as the Vegetable Powders, particularly Corium, Digitalis, Hyoscyamus; some roots, as the Sarsaparilla, and others which I need not enumerate. Now it is but an act of justice to the public generally, for the retail Druggist to be on his guard, and if medicines be sent to him in a deteriorated condition, forthwith to return the same, or if he hold any such, to throw them out immediately. Thus, to preserve the powders above-mentioned, small quantities ought only to be powdered at once, and never retained longer than six months, while the stock of the herbs should be carefully preserved from the light, and powdered as required.

Druggists generally call out loudly about Quackery; but really, Gentlemen, unless we have a reform amongst the Chemists, I think that greater empirics can nowhere exist, while they are enabled to cloak their proceedings under the garb of respectability, and thus impose upon and rob the people, in such a heartless and knavish way, that one is really disposed to condemn their proceedings, and to hope that your excellent advocacy of the honorable system may bring about some substantial good.

I remain, Gentlemen,
Your most obedient Servant,
A RETAIL CHEMIST.

Edinburgh, 16th Feb. 1841.

IMPROVED METHOD OF PREPARING THE NITRATE OF MERCURY OINTMENT.

This very useful ointment, when in its stronger form, is so hard and friable as to be very inconvenient, especially in winter.

The Pharmacopœia orders that the lard and oil, while hot, should be mixed with the solution of mercury, also hot. I have found, that if, instead of employing lard, olive oil only (of course the same quantity of *it* as of lard and oil together) be added to the nitrate of mercury, while both are cold, a very beautiful ointment is produced, of the same consistence as spermaceti ointment. The formula for preparing it would be thus:—

Take of mercury, one ounce,
Nitric acid, eleven fluid drachms,
Olive oil, ten fluid ounces.

Dissolve the mercury in the acid, and let it become cold. Add the oil, and stir the mixture occasionally for an hour or two, until it becomes united and of a proper density.

The strength here is the same as that ordered by the Pharmacopœia, and it is obvious that there can be no difference in the effect from the substitution of oil for lard.

G. E. J.

ERRORS IN DR. THOMPSON'S CONSPECTUS.

To the Editors of The Chemist.

Gentlemen,—Your correspondent J. H. (see Vol. I. page 250.) having not yet sent you any more of the errors in Dr. Thompson's Conspectus, to which he has so properly called the attention of the public, I take the liberty of sending you the subjoined, thinking that such an important subject should be delayed no longer.

I remain,
Gentlemen,
Your obedient servant,
—— R. N.

Acid. Hydrocyan. Dilut.—Dr. Thompson here orders Oſs of distilled water, in the place of Oiſs.

Cataplasma Conii.—℥j of the Ext. Conii ordered, instead of ij.

Cerat. Hydrarg. Co.—Entirely omitted.

Cerat. Plumbi Co.—Liquor Plumb. Diacet. f ℥ij instead of ℥iij.

Confect. Aromat.—Besides the error pointed out by your correspondent, viz. its being kept in the wet state, Testæ præpar. are ordered instead of Creta præpar.

Confect. Cassiæ.—Syr. Rosæ f ℥viij is ordered by the Pharmacopœia, whilst the Conspectus has Oſs.

Confect. Sennæ.—The College orders Oiij

of water, but Dr. Thompson increases it to Oiv.

Decoct. Amyli.—Omitted.

Emplast. Saponis.—lb.ij of the emp. plumbi, instead of lb.iij.

Enema Opii.—$\mathfrak{m}$ xx of tinct. opii, instead of $\mathfrak{m}$ xxx.

Ferri-ammonio-chlorid.—is called ferri-potassio-chlorid.

Liq. Ammoniæ Sesquicarb.—$\overline{3}$viij of the Sesquicarb. in the place of $\overline{3}$iv.

Liq. Hydrarg. Bichlor.—g.viij of the hydrarg. bichlor. and ammoniæ hydrochlor. in the place of g. x.

Liquor Potassæ.—Potassæ carb. g. x, instead of g. xv.

Mel Rosæ.—Oifs of water, ordered in the Conspectus, instead of Oiifs.

Mist. Spir. Vini Gall.—$\overline{3}$fs of sugar left out.

Plumbi Acetas.—The Conspectus orders lb.j of plumbi oxid. and the College lb.iv, and $\overline{3}$ij.

Spir. Ætheris Nit.—lb.ij of alcohol, instead of lb.iij.

Tinct. Balsami Tolut.—According to Dr. Thompson, there is not such a thing in the London Pharmacopœia.

Tinct. Colchic. Co.—Omitted.

Tinct. Opii.—Proof spirit ordered for rectified.

Unguent. Creosoti.—3j of creosote ordered for $\overline{3}$fs.

Unguent. Gallæ Co.—Ounces of galls ordered instead of drachms.

Unguent. Hydrarg. Nit.—Drachms of olium olivæ ordered for ounces.

Besides the above there are many others; such as, retaining the old names, which he does oftener than adopt the new; confounding the names of the Colleges; leaving out some of the officinal preparations, &c. &c. But as these mistakes are of minor importance, and not calculated to lead into error, I will not occupy any more of your valuable space; fearing I have encroached too much already. But as the above only relate to the London Pharmacopœia, I will, with your permission, send you another communication next month, detailing the errors as regard the Edinburgh and Dublin Pharmacopœiæ.

NEW AND MORE SCIENTIFIC PROCESS OF MAKING THE EMPLASTRUM PLUMBI PROTOXIDI.

BY CHARLES WATT.

The Pharmacopœia of the London College of Physicians, in the formula for compounding this plaster, and, indeed, for making most other chemical preparations, which are employed in medicine, presents a melancholy evidence of the grossest ignorance of chemical principles, on the part of those to whom its compilation is confided. For this there is no excuse—they are bound to acquire adequate knowledge of the subject; or, if they possess it not, to refer, for revision, to those who are able to set them right. The directions given by them for the formation of the plaster of oxide of lead, is totally at variance with the laws by which its components unite, and the quantities ordered are such as it is utterly impossible can be combined. In fact, the whole formula shews perfect ignorance of the actions which take place in the union of the constituents, as well as of the nature of the compound when formed.

In the process of making this plaster, the oxide of lead, in the form of a hydrate, unites with the olive oil in consequence of the change that substance undergoes during the boiling, viz. its conversion into oleic and stearic acids, a change which is precisely the same as that which takes place when oils or fats are converted into soap by the action of an alkali, as was first discovered by Chevreul. It is manifest, therefore, that the oxide of lead combines in definite, and in no other proportions.

The formula of the College is,—Oxide of lead, five pounds; olive oil, one gallon; water, two pints. Suspecting great inaccuracy, we have made the most careful analysis, and found the composition of the plaster to be oleic and stearic acids, two pounds and one-third; oxide of lead, one pound. On proceeding synthetically, we observed that in these, and in no other proportions, could they be combined. Feeling much for the labor caused to the operator in endeavouring to combine all the lead with the oil, and seeing the whole process to be a sad specimen of pharmaceutical chemistry, we adopted the following method as one far more simple and practicable. As the oil must be converted into the fat acids before it can unite with it, we boiled the olive oil with a small quantity of lime, until, on cooling, the compound was quite brittle;* we then separated the lime by dilute sulphuric acid, and left the whole to settle. When the oil had become perfectly free, we let off the water and sulphuric acid, and then added a corresponding proportion of oxide lead, as before stated, viz. to every two and one-third pounds, one pound of oxide thus prepared, namely, by precipitating it from its solution in nitric or acetic acids† by a caustic earth or alkali,

* Brittleness, when the compound is cool, is a proof of the completion of the saponification.

† Nitric acid, diluted with about six times its weight of water, when hot, dissolves a large quantity of protoxide of lead, and be-

and well washing it to remove any adhering salt. We boiled the two components in a wooden vessel provided with a leaden steam-pipe, and the plaster was formed of a much more beautiful color and texture, and with perfect ease as regards the operation.

The whole process, *i.e.* the boiling with lime, the separating it by sulphuric acid, and the subsequent formation of the plaster, may be conducted on the usual apparatus, but we prefer the above, which is precisely such as is used for making the stearine for candles.

EXPERIMENTS ON POISONING BY ARSENIC; MADE BEFORE THE ROYAL ACADEMY OF MEDICINE.

BY M. ORFILA.

M. ORFILA proposed to prove in four sittings:—1st. That arsenious acid and stibial tartar, introduced into the digestive canal, or placed on the subcutaneous cellular tissue, are absorbed, mixed with the blood, and carried into all the organs of the animal economy: 2nd. That they remain for a certain time in the viscera and muscles, where their presence may be demonstrated; but that from the commencement of the poisoning, a part of the absorbed portion abandons these tissues, and is eliminated by the urine. 3rd. That this elimination, much more rapid in the case of stibial tartar than in that of arsenious acid, continues for several days, and until the tissues in question are quite free from those poisons: 4th. That it is, therefore, advantageous, and even indispensable, in the treatment of poisoning by these substances, to favor the secretion of urine: 5th. That it is possible in many cases to distinguish whether the arsenious acid or stibial tartar, extracted from the viscera of a subject, have been absorbed during life, or whether they have arrived in those viscera in consequence of a *post mortem* imbibition: 6th. That the best processes for detecting the small quantities of these poisons absorbed consist in destroying the greater part or the whole of the organic matters, in carbonising them by means of nitric acid, or in decomposing them by nitrate of potassa, and in introducing the products into the modified Marsh's apparatus: 7th. That it is always easy to distinguish arsenic from antimony, under the form of stains, and to ascertain that these stains do not arise, either from the apparatus or from the chemical agents employed: 8th. That there exists in the bones of man and of many animals, an arsenical compound insoluble in water: 9th. That there may be extracted from the muscular flesh of man a matter which he thinks is formed of a very minute proportion of arsenic, of sulphur, and an organic substance: 10th. That there is found in the soils of certain cemeteries, and other burying-grounds, infinitely small quantities of arsenic which boiling water does not dissolve: 11th. Finally, that we may easily, in a medico-legal case, avoid the errors to which the presence of arsenic in the bones, the muscles and in the soils of certain cemeteries, would seem at first to have given rise.

Want of space prevents us from giving in this number the whole of the experiments made at the four sittings of the Academy of Medicine: we therefore give those made at the first and second,—reserving the third and fourth for future insertion.

FIRST SITTING; *October* 25, 1840.

The sitting was opened at a quarter past ten. M. Orfila explained the plan which he proposed to follow in his demonstrations. He detached the œsaphogus of a small white dog. He tied the conduit, and announced that the ligature would be maintained until two o'clock on the following day, and that the dog would be kept until the sitting of the 2nd of November, to show that he had not been greatly incommoded by the operation.

Into the stomach of a moderate sized and very healthy dog was introduced sixty centigrammes of arsenious acid dissolved in a hundred and fifty grammes of water: the necessary ligature was effected.

On the subcutaneous cellular tissue of another dog was applied, fifteen centigrammes of finely powdered arsenious acid: the edges of the wound were united by some points of suture.

Another dog was poisoned like the preceding with fifteen centigrammes of stibial tartar.

A dog was hung without being poisoned. He was immediately opened, and the liver, the spleen, the kidneys, the heart and the lungs were taken out and dried. The dry product was carbonised in a new porcelain capsule, with three times its weight of concentrated pure nitric acid, marking forty-one degrees of the areometer. The carbon obtained was treated for twenty minutes by boiling distilled water: the filtered liquor, which was of a reddish color, was put into a Marsh's apparatus, previously tried; it did not yield any arsenical or other stain, even at the expiration of half an hour.

At half-past ten, six kilogrammes of the

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comes a dinitrate; and acetic acid boiled with the oxide, also takes up a very large portion: from either of these solutions, the hydrate of lime, soda, or potassa, will precipitate it in the form of a beautiful hydrated protoxide.

muscular flesh of man were set on to boil, in a large porcelain capsule, with distilled water, and an ounce of alcoholized potassa.

There was also boiled with water, in a porcelain capsule, the liver of an adult cut in small pieces.

The bones of man were calcined at a high temperature and at a lower one: these bones, rendered friable, were powdered and sifted: the first gave a white powder, and the other, a black one: eight ounces of each of these were decomposed in two porcelain capsules, by four ounces of pure sulphuric acid and water. These mixtures were left to themselves for some days.

In two hours and a quarter, the poisoned dog not being dead, he was hanged, and, immediately after death, the bladder, containing about twenty-four grammes of urine, was extracted; the liver was separated without injuring the digestive canal. The quarter of this liver was dried and carbonised by nitric acid, as the viscera of the normal dog had been. The carbon obtained was boiled for twenty minutes with distilled water. It was filtered: the liquid, which was of a reddish color, was scarcely introduced into Marsh's apparatus, previously tried, as in the last instance, when it yielded numerous large brown and shining arsenical stains. The urine of this animal gave yellow shining arsenical stains, when put in Marsh's apparatus with a quantity of olive oil; this apparatus yielded no arsenic before the urine was introduced.

The urine of the unpoisoned dog, treated in the same manner, gave no trace of arsenic.

Marsh's Apparatus.—Some zinc and distilled sulphuric acid were introduced into a flask of water: hydrogen gas was disengaged for about an hour; the flame was very nearly two lines, and not the slightest trace of arsenic was obtained on the porcelain plates.

Another apparatus, into which some of the same sulphuric acid and zinc were introduced, acted for ten minutes without yielding arsenic, but at the very instant a drop of a concentrated solution of arsenious acid was added, numerous large brown arsenical stains were deposited on the plate.

Into a flask filled with hydro-sulphuric acid gas, was introduced a mixture of two parts of water and one part of pure sulphuric acid: nothing but milk-white sulphur was precipitated, whilst the same mixture, with a drop of a solution of arsenious acid previously added, gave a canary yellow precipitate of sulphuret of arsenic.

Characters of Arsenical and Antimonial Stains.—Arsenical stains present a very different appearance from antimonial ones: the first, submitted to the action of the flame of pure hydrogen, were almost instantly volatilised; they were spread, became less intense, and have remained even for some minutes. Both immediately disappeared by the action of pure and concentrated nitric acid, and, by evaporating the liquors, we obtain with the arsenical stains, a residue of a yellowish white, and, with antimonial stains, a yellow residue. The capsules were left to cool, and the two residues were touched with neutral nitrate of silver; the arsenical residue gave a brick-red arseniate of silver, whilst the antimonial product was unaltered.

An ounce of dry gelatine was heated with an equal quantity of pure nitric acid at 41°; six minutes scarcely elapsed before a very fine carbon was obtained.

MM. Husson and Pelletier, members of the commission, assisted in all the experiments which were made from a quarter past ten until the sitting rose, at a quarter past four. The products of the different operations which could not be finished in the day, were put under seal, and confided to M. Husson.

Second Sitting; *October 26th*, 1840.

1st. At nine o'clock in the morning, in presence of MM. Husson, Amusat, Caventou, &c., and after having inspected the seals, the different capsules containing the residues of the operations of the day before were drawn from the cabinet in which they had been placed.

2nd. The decoction of the muscular flesh made by five hours' boiling was strained through a fine cloth; it was evaporated to dryness, and carbonised with pure concentrated nitric acid; the carbon was put in contact with boiling distilled water, for twenty minutes, the liquor was filtered and kept, after being ticketed.

3rd. The decoction prepared the day before with the liver of a human adult who had not been poisoned, was also passed through a cloth; it was evaporated, after having mixed with it sixty grammes of pure nitre from the laboratory of the faculty. The dried product was burned in a Hessian crucible reddened in the fire. The remaining solid matter was dissolved in water, and decomposed by pure sulphuric acid: the liquid after being boiled for an hour, was kept to be tried afterwards.

4th. Three-quarters of the liver of the animal, poisoned the night before by sixty centigrammes of arsenious acid, was boiled for three hours, in a porcelain capsule, with distilled water. The decoction, strained through a cloth, and mixed with sixty grammes of pure nitre of the laboratory, was evaporated to dryness, and burnt in a new Hessian crucible, reddened in the fire. The mass resulting from this combustion was treated with water and pure sulphuric

acid, like the preceding. The liquid was set aside and kept.

5th. At nine o'clock a moderate-sized dog was poisoned, by introducing into his stomach sixty centigrammes of stibial tartar, dissolved in a hundred and fifty grammes of water. The necessary ligatures were made: in an hour and three-quarters, the animal not being dead, was hanged. The bladder contained scarcely six grammes of urine, which was collected. Half the liver of this dog was dried and carbonised. The carbon was treated for a quarter of an hour by pure hydrochloric acid, mixed with a fourth of its weight of water. The filtered liquid was kept. The urine of this animal (six grammes) evaporated to dryness and carbonised, was subjected to the action of boiling hydrochloric acid, diluted with a fourth of its weight of water. The filtered liquid was preserved.

6th. In the same way was treated a hundred and fifty grammes of urine from the dog poisoned the day before by fifteen centigrammes of stibial tartar applied to the subcutaneous cellular tissue of the thigh. This dog not being dead at 10 o'clock, was hanged.

7th. At ten o'clock in the morning, M.—— having furnished five hundred grammes of crystallised nitre, and as much nitre in mass; these two nitres were pulverised and mixed together in a marble mortar. Half of this mixture was decomposed by four hundred and forty-eight grammes of pure and concentrated sulphuric acid, in a porcelain capsule, with the aid of heat. The liquor, diluted with water and filtered, was set aside. The other half of this nitre was treated in the same manner after a centigramme of arsenic acid had been added to it.

At two o'clock precisely, M. Orfila read the minutes of the proceedings at the last sitting, which being correct, were signed by the members of the commission. M. Orfila detached the ligature applied the day before to the white dog. This very lively animal, suffered syncope whilst they sought the ligature, which was situated very deep, on account of the swelling of the flesh, and of the already inflamed lips of the wound. The operation had been performed twenty-four hours previously.

Immediately after, the two liquors obtained with the nitric and sulphuric acid, (*vide* 7th) were introduced into two great Marsh's apparatus, previously tested: the disengagement of gas was so great, especially with the arsenical liquid, that it was necessary to remove half, and to add a considerable quantity of water. The gas was inflamed, and although the flame was strong, numerous large arsenical stains were deposited on the capsule. The other liquid, which had not been mixed with arsenic acid, was less acid than the preceding, because by boiling it had lost a greater quantity of sulphuric acid; on this account, it was hardly necessary to remove one-third of the liquor, which was replaced by water. The gas burnt with a flame of two or three lines, much weaker than that of the preceding liquid. It was was impossible to obtain the slightest stain of arsenic, or indeed any other stain.

The liquor No. 2, arising from the muscular flesh, placed in a Marsh's apparatus, gave with difficulty, some large, white, opaque stains, and a few other brown, dull stains.

The liquor No. 3, arising from the normal liver, put in an apparatus previously tested, yielded no stain: the flame was good.

The liquid No. 4, obtained with three quarters of the liver of the animal poisoned the day before with sixty centigrammes of arsenious acid, introduced into a Marsh's apparatus, previously tested, gave a great many brown shining stains.

The six grammes of urine from the dog poised in the morning, furnished no antimony (*vide* 5th.)

The half of the liver of that animal gave a liquid (*vide* 5th), which, being put in a Marsh's apparatus, almost immediately yielded numerous large antimonial stains.

The liquid arising from the urine of the dog poisoned by fifteen centigrammes of stibial tartar, applied to the thigh (*vide* No. 6), was scarcely introduced into a Marsh's apparatus, when it gave a prodigious quantity of antimonial stains.

The dog poisoned the day before by fifteen centigrammes of arsenious acid applied to the subcutaneous cellular tissue of the thigh, died during the night. The bladder was empty, although the animal had not made water. This organ was washed with distilled water, and the liquid was put in a Marsh's apparatus, with about two ounces of olive oil. In a few minutes, three or four small yellow shining stains were obtained, which were evidently arsenical.

The sitting rose at a quarter to four, and the two capsules containing the bones calcined on the 25th, were put under seal.

M. Orfila explained the necessary processes:—

1st. To disengage arsenic from antimony, when the individual poisoned had been treated with stibial tartar:

2nd. To discover whether or not in a case where an individual has been poisoned by arsenious acid, and treated by peroxide of iron, the arsenical stains arise from the peroxide used as a counter-poison.

3rd. Whether in the case where the soil of a cemetery contains arsenic, this substance can be communicated to the body.

4th. Whether the ingestion of arsenious

acid into a body can determine an imbibition of a nature to give the same phenomena as produced by poisoning.

ERGOT OF RYE IN PREMATURE LABOUR.*

BY JOSEPH HODGSON.

Mrs. M., residing at Salvador House, Bishopsgate-street; of fair complexion, and other general characteristics of the strumous diathesis; has been married eight years, and is now thirty-four years of age; within twelve months of her marriage, at the full period of gestation, after a tedious labour of forty-eight hours, she was delivered of a living female child. Two years subsequently she miscarried, at the fourth month; and then, after eighteen months, gave birth to a still-born child at the seventh month.

On the 17th of May, 1839, she came under my observation, being again threatened with premature labour, at the seventh month, which was averted by placing her under favourable circumstances, and her pregnancy continued to the eighth month, when labour came on, and, after seven hours, the breech descended with the abdomen towards the sacrum; but, notwithstanding the chin was depressed upon the chest, I could not succeed in extracting the head without lessening it, by the operation of craniotomy.

Taking all the circumstances into consideration, and being of opinion that the pelvis had contracted in size, I desired my patient, the next time she became pregnant, to inform me at the seventh month, in order that I might have an opportunity of bringing on labour at that time, as the only likely means of insuring the birth of a living child. Accordingly, in the middle of November, she informed me that she was then pregnant, and could trace her pregnancy from the middle of June. She continued in very good health during the remainder of the time, up to the 16th of January last, when I found her in good spirits.

Noon, January 16. I prescribed ten grains of ergot of rye every four hours, to the extent of six doses; visited her at nine o'clock in the evening, one hour after taking the third dose. She stated that every dose produced pains in the back, which continued about half an hour, or from that to three-quarters.

17th, 10, A.M. She had taken the sixth and last dose of the medicine, which at that time was causing her pain, and on making an examination, I found the os uteri softened, and readily admitting one finger, and then a second, between which I passed the stilet of the female catheter, and ruptured the membranes, presentation natural, and the child's movements distinctly felt. I then returned home, requesting to be called when pains came on. 5, P.M. Seven hours from the time the membranes were ruptured, and os uteri fully dilated, the pains became regular, but having waited until half-past seven, and being quite satisfied that they were insufficient to complete the delivery, and also fearing the child would be destroyed by the pressure of the uterus, I mixed 3j of ergot of rye in 3iv of water, and ordered one-third to be given every ten minutes, until the uterus acted vigorously; it was not before the third dose had been exhibited that any great increase of uterine action took place, and then, at the end of an hour, a living female child was expelled, which, with the mother, is now doing well.

Remarks.—The exhibition of the secale cornutum, previously to rupturing the membranes by mechanical means, appears to soften the os uteri, and generally to stimulate the action of that organ; and the practice accords with that recommended by Dr. F. H. Ramsbotham, in his valuable work, now in course of publication.

The novel feature in this case is the renewed administration of the secale after the evacuation of the liquor amnii, when the uterus was powerfully contracting, but its expulsive action feeble.

I attribute the preservation of the life of the infant to such administration; an opinion in which Dr. R. fully concurs.

* From *The Lancet*.

IODIDE OF POTASSIUM IN SYPHILIS.

Mr. ROBINS detailed to the Westminster Medical Society, at its meeting on the 7th of November, 1840, a case of "venereal sores," treated by mercury, and followed by secondary symptoms, which gave way under the use of sarsaparilla, iodide of potassium, and Plummer's pill. He put some questions to the society in reference to the relative value of these agents in syphilitic diseases.

Mr. WINSLOW had found the iodide of potassium of much service, both in primary and secondary syphilis.

Mr. H. JOHNSON had used the iodide of potassium in primary sores, and had not been satisfied with the results. He had found, however, that it was of much service in cases of irritable phagedænic kinds of ulceration, which were the sequelæ of syphilis, and connected with a cachectic state of the system.

Mr. RUTHERFORD ALCOCK had also little

faith in the iodide of potassium as a remedy in the primary forms of syphilis. In the secondary symptoms of the disease occurring in cachectic habits, particularly in affections of the joints and periosteum, he had found it of great service. He believed that this medicine acted as a powerful and beneficent alterative.

Dr. Addison inquired, if any member had seen the dingy papular eruption, generally considered as a secondary symptom of syphilis in any case in which that poison had not entered into the system. He had always found it to be the result of such a poison.

Mr. H. Johnson had seen it in many cases, in which he firmly believed that it was the result of mercury alone.

BOOKS RECEIVED.

The Seventh Annual Report of the Royal Cornwall Polytechnic Society, 1839. Falmouth: Jane Fratham, Market-street. London: Simpkin and Marshall.

Griffin's Scientific Miscellany, No. V. Instructions for the discrimination of Minerals by Simple Chemical Experiments. By Franz Von Kobell, Professor of Mineralogy in the University of Munich. Translated from the German, by Robert Corbet Campbell. Glasgow: R. Griffin & Co. Tegg, London.

[We purpose reviewing this in our next: it came too late for the present number.]

The Touchstone of Medical Reform; in Three Letters addressed to Sir Robert Harry Inglis, Bart. M.P. By Joseph Henry Green, F.R.S., Professor of Anatomy to the Royal Academy; one of the Surgeons of St. Thomas's Hospital, &c. London: S. Highley, Fleet-street, 1841.

TO CORRESPONDENTS.

Mr. Osborn and Mr. Viper in our next.

A Subscriber is informed that The Chemist is always ready in sufficient time to reach Nottingham on the day of publication: if it does not do so, the fault never rests with us.

B. B. and J. G. are unavoidably deferred until next month.

An Abridgement of Mr. Hawes's Bill was given in The Chemist, No. XII.

"A Subscriber to The Chemist" is informed that he would be compelled to undergo an examination previous to going into business under the circumstances he mentions.

A Subscriber and Well-Wisher.—It is not usual to do so.

Mr. Harper and Mr. Brewin will have received private communications.

Nota Bene.—*All Communications and Books for Review must be addressed, "To the Editors of The Chemist, care of Mr Hastings, Publisher, 13, Carey-street, Lincoln's Inn Fields, London." Communications must be pre-paid, and sent before the 15th of each month; Books for Review, before the 10th.*

ERRATA.—No. XIV.

Page 54, column 1, line 39,—for "predicaments" read "medicaments."

Page 54, column 2, note,—read thus—"Such attention to serve his profession would elevate him more than can any acts of the legislature, which would best protect the interests of society, by compelling him to increase his stock of knowledge, or at once to merge him into his origin—the chemist and druggist. Ledgers and day-books are not the companions of scientific research," &c. &c.

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THE CHEMIST.

I. CHEMISTRY.

INVESTIGATIONS CONCERNING ULMIC ACID.*

BY EUGÈNE PÉLIGOT.

Most non-volatile organic matters, submitted to the action of chemical agents endowed with the most powerful affinities, before arriving at ultimate decomposition, undergo a kind of alteration which converts them into substances of a black or brown color, soluble in water or the alkalis. The action of heat, properly applied, converts sugar into caramel, and tannin into metagallic acid, and starch, gum, and tartaric and citric acids undergo similar alterations: potassa heated with wood changes it into a black acid, soluble in the alkalis: sulphuric acid blackens sugar, without heat, and under the influence of water and prolonged boiling, produces, like most other acids, a brown substance. Indeed, the spontaneous destruction of vegetables engenders a brown body, which nature presents us with in abundance, in turf, in the soil, in the dunghill, and in the various substances which, under the names of catechu, umber, sepia, &c., are employed as coloring matters.

Vauquelin first drew the attention of chemists to the brown substance which exudes from the ulcers of certain trees, and particularly the elm. Thomson gave this matter the name of *ulmine*.

In the remarkable memoir, on the properties of wood, which he published in 1819, M. Braconnot acquainted us with the conversion of this body into ulmine, under the influence of heat and caustic potassa. At the same time he gave the principal characteristics of this substance, which he considered as identical with the matter noticed by Vauquelin.

In a dissertation on ulmine, which he published in 1830, M. Polydore Boullay added much to our knowledge of this substance: he put beyond doubt its property of combining with bases, and he assigned it, in consequence, the name of *ulmic acid:* moreover, he undertook the determination of its constituent elements, and of its atomic weight.

In continuing my investigations concerning saccharine matters, I was led to study, *de novo*, the brown matters produced by the contact of sugar of starch with the alkalis. I have shown in a former memoir that it contains more carbon than exists in ulmic acid, according to known analyses: in endeavouring to study these two substances comparatively, I thought I perceived that much remained to be done with regard to *ulmic* acid itself, and that all the substances designated by that name were far from presenting the same characteristics: it appeared to me, besides, that now it became more easy to follow into their different phases the various transformations which organic bodies undergo, we cannot admit, at least without decisive proofs, the formation of a single and similar substance, as a consequence of various, and sometimes opposed, circumstances. How, in fact, is the formation of ulmic acid, sometimes under the influence of caustic alkalis, sometimes by the action of the more powerful acids, and at other times, by the simple effect of a kind of fermentation, by a spontaneous decomposition, to be explained? Thus, notwithstanding the proper confidence inspired by the names of the chemists, whom I have mentioned, I thought it advisable to try some experiments on the various black matters designated or confounded by the name of ulmine or ulmic acid.

M. Braconnot prepared artificial ulmine by heating in a silver crucible equal parts of caustic potassa and saw-dust, moistened with a little water. At a certain temperature, the mixture, which was kept stirred, became soft and pasty, and swelled up very much: when the crucible was removed from the fire, and water poured in, almost all the matter

* *Annales de Chimie et de Physique;* vol. lxxiii., p. 208.

was dissolved, and constituted a brown liquor, from which an acid separated ulmic acid, which precipitated under the form of brown flocks, which were washed in a large quantity of water, for this acid is insoluble in water.

In the dry state, it was of a brilliant black, like coal: it very readily dissolved in alcohol; it formed soluble salts with potassa, soda, and ammonia, and completely neutralised the alkaline properties of those bases.

M. Braconnot's process readily produces ulmic acid: nevertheless, on account of the tumefaction of the mixture, at a certain stage of the operation, which tumefaction is owing to a disengagement of hydrogen gas, as M. Chevreul observed, but little ulmate of potassa can be obtained in one operation. I have found it infinitely more convenient to prepare it in a spacious vessel, such as a silver or cast-iron basin: thus may be obtained, in a few minutes, a great quantity of ulmate of potassa.

M. Braconnot admits that wood, in being converted into ulmic acid, simply allows a portion of its oxygen and hydrogen to be disengaged in the state of water, and this is changed into a substance in which carbon alone becomes predominant. Thus, according to that able chemist, the composition of ulmic acid is represented by that of wood, minus a certain quantity of water, which, according to him, is the only essential product formed in the reaction. M. P. Boullay determined the composition of ulmic acid prepared by M. Braconnot's process, and he found that it was formed of

Carbon	56·7
Oxygen and hydrogen, in the proportions to form water . .	43·3
	100·0

The formula $C^{60}\ H^{30}\ O^{15}$ would represent the atomic weight of this acid.

Since M. Braconnot's experiments, M. Chevreul has shown that wood and potassa give with water, after having been heated, a solution which becomes brown only under the influence of the oxygen of the atmosphere. From this experiment it has been concluded that the presence of air is necessary for the formation of ulmic acid.

I endeavoured to confirm with all possible care, the results which I have just related, and my experiments have often been at variance with existing opinions concerning the formation and composition of ulmic acid.

To obtain the ulmic acid which I have used in my experiments, I employed very fine saw-dust, perfectly freed, by the alternate action of water, alcohol, acids and alkalis, from the various substances soluble in those agents and foreign to the constitution of wood. In precipitating, by means of a mineral acid, the ulmic acid from its combination with potassa directly obtained with the proportions and precautions indicated by M. Braconnot, I immediately perceived that there existed very perceptible differences in the color of the acids furnished by different successive operations. The product obtained was sometimes black, sometimes brown, and at other times of a yellowish grey.

I set about ascertaining the causes of this variation of color. At first I thought they depended solely on the more or less complete absorption of oxygen during the formation of the ulmate of potassa: but this opinion does not appear correct, for I have proved that the time during which the operation lasts in contact with the air has no very perceptible influence on the color of the product.

This difference of color is owing to the more or less elevated temperature to which the potassa and saw-dust are exposed. I obtained at pleasure, with the same substances, a product of a very light chamois color, and ulmic acid as black as coal.

If it be wished to produce the substance almost colorless, the mixture must be slowly heated to a moderate degree, taking care to keep it constantly stirred, to avoid the unequal distribution of heat: when the matter begins to soften, it is removed further from the fire, continuing to mix it with an iron spatula. On afterwards treating it with cold water, a portion of the ligneous matter remained unattacked: another portion formed with the potassa a combination which, although brown when dissolved and exposed to the air, yields, on decomposition by a mineral acid, a yellowish precipitate which must be washed in warm or tepid water; for this body melts in hot water, and when once melted, it is very difficult to wash it further.

This product may be obtained with still greater facility by using two parts of saw-dust and one part of potassa, instead of equal parts: the fusion of the mixture being slower, enables one to govern the operation, and it becomes very difficult to exceed this first phase of the alteration of the wood.

True ulmic acid, that is to say, the blackest, is always obtained identical, by operating in the opposite manner. The mixture must be strongly heated, and the action of the heat must even be prolonged, so as to decompose a portion of the ulmate of potassa produced: the aqueous solution of the residue then furnishes, by an acid, a precipitate which should be black. When it is not black, the acid must be again heated with a fresh quantity of potassa, then separated and purified in the same manner.

Thus prepared, black ulmic acid, dried at 126° C., *in vacuo*, gave by analysis the following results:—

	*(1)	(2)	(3)	(4)	(5)	(6)
Carbon	72·3	71·5	72·1	72·1	72·3	72·0
Hydrogen	6·2	6·1	5·8	6·3	6·0	7·4
Oxygen	21·5	22·5	22·1	22·6	21·7	21·6
	100·0	100·0	100·0	100·0	100·0	100·0

It is well understood that these analyses were made on products resulting from different preparations.

If these analyses are correct, they tend to prove that ulmic acid has an elementary composition, and a constitution, very different from those deduced from the experiments made previous to mine.

In fact, this acid contains, according to the preceding analyses, 14·7 per cent. of carbon more than M. P. Boullay found.

Besides, it contains more hydrogen than is required to form water with its oxygen: M. Braconnot's theory of its production, therefore, becomes totally inadmissible.

It is evident to me that the very great differences between M. Boullay's analyses and mine are owing to the impossibility of completely burning the ulmic acid in the analytical apparatus employed by him. I do not think that in the whole organic kingdom, there is a substance more difficult to burn with oxide of copper than ulmic acid: in the bad glass tubes employed by chemists some years ago, this combustion must of necessity have been incomplete. The tube would be fused before the conclusion of the experiment, so that it could not be finished. It is only since we have had much less fusible glass tubes, that analyses of this kind have become possible. I do not pretend that they are easy; for the addition of chlorate of potassa mixed with the matter to be analysed, appeared to me indispensable for combustion to be with certainty effected: without this addition, the analysis of the ulmate of silver itself almost always shows a loss of 3 or 4 per cent. of carbon.

With respect to the 2 per cent. of hydrogen which I have obtained more than M. Boullay, it is easily accounted for, by remembering that the oxygen being proportioned by loss, its quantity is found surcharged with that of unburnt carbon, and may therefore attain the proportion of the elements of water with the hydrogen directly obtained. Nearly as we agree concerning this direct determination of hydrogen in the state of water, it does not the less result from my analyses that ulmic acid contains one half more hydrogen than is necessary for forming water with its oxygen.

It is also possible that M. Boullay may have analysed a mixture of the two products which may be formed in the treatment of wood by potassa: now the yellow product contains 7 or 8 per cent. of carbon less than that we have just been speaking of, as shown by the following analyses:—

Chamois yellow acid dried at 100° C[1]			
Carbon .	65·8	67·6	65·9
Hydrogen .	6·3	6·2	lost.
Oxygen .	28·9	26·2	
	101·0	100·0	

I do not think, however, that this product, as I have obtained it, should be considered as a pure substance: nor do I here insist on its analyses and properties; the low temperature at which this body is formed may allow the different substances resulting from the action of heat on the wood, to remain in it; M. Payen's observations concerning the latter body also show that it is of a complex nature, formed of several distinct substances which, doubtless, must be separately treated by potassa, to obtain in a state of greater purity a body of so immediate a derivation.

With black ulmic acid, I think that it is otherwise: at the very high temperature at which the ulmate of potassa is produced and maintained, it does not appear that any other organic products can exist, and the different varieties of wood ought to produce the same body, which, besides, precedes their ultimate decomposition: I have always obtained an identical acid by employing wood procured from different sources.

After having determined the composition of this acid, I endeavoured to fix its atomic weight; but this was attended with difficulties very different from those of its elemen-

*(1)	Matter employed	0·308
	Carbonic acid	0·805
	Water	0·374
(2)	Matter employed	0·296
	Carbonic acid	0·765
	Water	0·164
(3)	Matter employed	0.340
	Carbonic acid	0.886
	Water	0·178
(4)	Matter employed	0·322
	Carbonic acid	0·840
	Water	0.183
(5)	Matter employed	0·387
	Carbonic acid	1·012
	Water	0·212
(6)	Matter employed	0·205
	Carbonic acid	0·534
	Water	0·119

tary analysis: I was unable, notwithstanding repeated trials, to obtain with certainty salts presenting an uniform quantity of base. However, in interpreting the composition of various salts of silver and potassa, I consider the following formula very probable as representing ulmic acid, free or combined with bases:—

C^{54} . . .	2066·0	72·3
H^{28} . . .	174·7	6·1
O^{6} . . .	600·0	22·6
	2840·7	101·0

This formula perfectly coincides with my analyses of the free acid.

By preparing, with the greatest possible care, ulmate of silver by double decomposition, by means of nitrate of silver and ulmate of ammonia containing a slight excess of ammonia, I obtained, by calcining the salt which had been well washed and dried:—

	I.	II.
Silver . .	31·3	31·5

I. 0·781 of ulmate of silver gave 0·151 silver;

II. 0·633 of ulmate of silver gave 0·200 silver.

Now the formula $C^{54}\ H^{28}\ O^{6}$, Ag O gives by calcination 31·6 of silver: the elementary analysis of this salt seems to indicate that the free acid does not lose water in combining with bases.

The ulmate of potassa which I analysed was prepared pure potassa and ulmic acid in excess: the soluble compound was evaporated *in vacuo*, and dried at 120° C.: it yielded 16·8 per cent. of potassa; the formula $C^{54}\ H^{28}\ O^{6}$, KO supposes 17·1.

The difficulties which I met with in the preparation of the ulmates as definite and uniform bodies, are owing, in my opinion, partly to the insolubility of ulmic acid in water; and partly, to its little energy as an acid: moreover, this body acts, in all respects, like a coloring matter. It attaches itself to all bodies presented to it, and has a tendency to form a kind of lac with various metallic oxides: the alkaline ulmates themselves, although soluble in pure water, become insoluble in impure water; which explains why, in the double decompositions formed by these salts, different salts are obtained with the same liquors according as they are more or less concentrated. It is well known how difficult it is to determine the atomic weight of coloring matters.

It remains for me to explain the manner in which ulmic acid is formed, by the contact of ligneous matter with potassa. I have made many experiments which appear to me to throw some light on this subject, complicated as it appears.

We know that the production of ulmate of potassa is always accompanied by a disengagement of hydrogen. We have just seen that the acid obtained contains much more hydrogen than is required to represent water with the oxygen which it contains. Finally, it is admitted, that the contact of air is necessary in this reaction.

I endeavoured to verify the latter point, and the following experiments seem to me of a nature to put it beyond doubt. I heated in a glass matrass equal parts of potassa and wood, moistened with a large quantity of water: the matrass was furnished with a tube dipping into mercury. As the reaction commences only after the disengagement of the water in the state of vapor, I considered that the air would be expelled by the steam: however, by continuing the heat, ulmate of potassa was formed. But this mode of operation was unsatisfactory, on account of the impossibility of stirring the mixture, and of obtaining an almost uniform heat in the mass. I also endeavoured to avoid this cause of error, by introducing into the matrass, with the potassa and moistened wood, one or two kilogrammes of mercury. This metal, directly receiving the heat of the furnace, transmitted it with more equality to the mixture: by gradually heating the mercury to boiling, air and steam were at first disengaged. Then hydrogen in great abundance. The product remaining in the matrass was completely soluble in water: it was ulmate of potassa.

This experiment, which has been several times repeated, has always furnished very clear results: the product, precipitated by an acid, was always brown or black, according as the temperature to which the mixture was subjected was more or less intense.

Independently of the hydrogen, oily substances are produced, which remain partly in the matrass mixed with the ulmic acid: besides which a great quantity of pyroxylic spirit is formed, and is distilled over with the water.

Black ulmic acid is formed, therefore, without the intervention of the oxygen of the air: this conclusion is in noway at variance with M. Chevreul's experiment above-mentioned; for that celebrated chemist seems to have been one of the first who studied the products of the alteration of wood by potassa, which has formed with water a colorless solution, which became colored in the air. I do not think that M. Chevreul examined the nature of the free acid, and I have every reason to believe that it was not so black as that studied in this memoir.

From the composition of wood, and considering the excess of hydrogen which ulmic acid contains relative to that body, it became probable that it would form, at the same time, a complementary substance, containing more oxygen than exists in wood and ulmic acid.

I have ascertained that this complementary body undergoes successive transformations, and that it consists, according to the temperature at which it is produced, of formiate, oxalate, or carbonate of potassa.

If, indeed, the liquor from which has been separated the yellow insoluble matter that precedes the formation of the ulmic acid, be distilled with sulphuric acid, there passes over an acid which reduces the salts of silver and mercury with the greatest facility: it is formic acid.

When we operate so as to obtain real ulmate of potassa, if the brown liquor obtained be evaporated without previously precipitating the ulmic from it by an acid, a very abundant crystallization of oxalate of potassa is obtained.

M. Gay-Lussac has long since remarked the formation of oxalic acid, under similar circumstances.

Finally, if the temperature has been too high, carbonate of potassa is produced.

The existence of these complementary products being proved, it is easy to explain the disengagement of hydrogen: it is owing to the successive conversion of formiate into oxalate of potassa, and of the oxalate into carbonate of the same base.

Direct experiment has, indeed, shewn me that, by heating formiate of potassa with an excess of alkali, at a moderate temperature, it is converted into the oxalate with a disengagement of hydrogen, as the following formula expresses:—

$C^4 H^2 O^4, K O = C^4 O, K O, + H^2$.

If, in its turn, oxalate of potassa be heated with hydrate of potassa, carbonate of that base is obtained, with a disengagement of hydrogen:—

$C^4 O^3, K O + K O, H^2 O = C^4 O^4, 2 K O + H.^2$

It is therefore clearly seen whence comes the hydrogen, in the course of the transformation of wood, under the influence of potassa, first, into a yellow product and formic acid, afterwards into ulmic and oxalic acids, finally into carbon and undetermined matters, and into carbonic acid. Ulmate of potassa may also exist at the temperature at which oxalic passes to the state of carbonic acid.

The production of two distinct acids in this action of potassa, goes into the nature of the ordinary alterations produced by this base on non-volatile organic substances.

It is evident that it would be easy for me to establish the foregoing reactions, by atomic formulæ; but I think I ought to abstain from these chemical equations, not being sufficiently acquainted with the formula of ligneous matter, in the first place; and in the next, not having been able to determine the relative quantities of the two products of the reaction, on account of the difficulties to which I have already alluded.

Such are the results which the study of ulmic acid has furnished to me. In the discussion concerning the composition of this acid, it may be remarked that I have not spoken of M. Malaguti's recent work on the formation of ulmic acid by sugar and dilute acids: in his work, however, M. Malaguti gives an analysis which agrees with M. P. Boullay's results, and which, therefore, is very much at variance with mine: in fact, I have not paid much attention to this difference, having ascertained that the black product studied by M. Malaguti is not ulmic acid; it is insoluble in alcohol, whilst ulmic acid readily dissolves in it in large quantity. M. Malaguti, since my observations, has devoted himself to new investigations concerning the composition of the acid which he obtained.

I am, besides, in a situation to shew that the very numerous brown bodies which are at present confounded under the name of ulmic acid, are entirely distinct from that acid. The comparative study of the properties and composition of these different substances forms the subject of a work which I shall very soon have the honor of presenting to the Academy.

ON THE ELEMENTARY COMPOSITION OF CERTAIN SPECIES OF ANTHRACITE.*

BY M. JACQUELAIN.

Of all the combustible minerals which at different times have attracted the attention of chemists, coal, as much on account of its abundance as of its easy and varied uses, is the only species of combustible concerning the composition of which we now possess any accurate notions. We cannot but mention as a remarkable work on these substances, that of M. Karsten, and especially that of M. Regnault, and summing up with more justice the observations of Klaproth, Thomson, and Héricart de Thury, who had tried too difficult analyses to be realised in their time.

Anthracite, on the contrary, as a most refractory combustible, seems to have been put aside in all these studies, or, at any rate, the few analyses that have been made shew us only the proportions of carbon, ashes, and volatile matters proportioned by difference.

No one would now dare to dispute the numerous services for which we are indebted to investigations of elementary analyses made in great number, and comparatively applied to impure substances. As-

* *Annales de Chimie et de Physique*; tom. lxxxiv.

surely it must tend to this end: but I am far from partaking the opinion of chemists, who would not see in the trials of these matters by fire, or by other agents, the possibility of acquiring some information respecting their intimate nature; I think, on the contrary, that both methods must be made use of. It is in this direction that I have undertaken the study of some kinds of anthracite. The following is the course which I adopted:—

The carbon, hydrogen, nitrogen and oxygen, were determined with all possible care, by the ordinary process of organic analysis.

The proportion of ashes was obtained by slow incineration in a muffle.

The presence of sulphur, arising from the pyrites, was easily detected, by acting on the combustible reduced to an impalpable powder, with *aqua regia*.

Finally, to ascertain the nature of the volatile products yielded by this anthracite at an elevated temperature, 60 grammes of the matter, in small pieces, free from dust, were put into a porcelain tube sealed at one end; the other end communicated by means of a safety tube with a flask containing alcohol, and furnished with a gas tube; the cylinder was placed horizontally in a forge, and the heat was continued until gas ceased to be produced. The latter having been fractioned, the different products were successively analysed over water; then, making a mixture of the latter, the analysis was recommenced over water and mercury, in order to see if the means agreed.

The action of aqueous chlorine on all these gases, and the eudiometrical analysis showed me that I had extracted from each anthracite, hydrogen mixed with a small quantity of carburetted hydrogen, capable of being converted into solid chloride of carbon. I shall show that the composition of this carburetted hydrogen corresponds with the state of condensation of methylene.

Finally, the mean of each very dry gaseous mixture being treated by melted potassium, there always resulted from it an absorption equal to the volume of free hydrogen supposed to exist in the mixture.

I.—Anthracite of Swansea.

Density=1.27.

Physical Properties.—Of a shining black, very compact lamellar structure, fracture rough in the direction of the superposition of the laminæ; homogeneous in all the samples, brittle, difficult to pulverise; its powder does not soil the fingers. This combustible burns without disaggregation, and without producing flames.

ANALYSIS OF THE FRACTIONED GAS.

	I.	II.	III.	IV.	V.	VI.	VII.	VIII.	Total.
Gas employed	100	100	100	100	100	100	100	100	800
Oxygen employed	100	100	100	100	100	100	100	100	800
Residue after detonation and the action of potassa	28	23	28	38	42	43	49	50	301

	Calculated mean of partial analyses.	Analysis of the whole mixture over water.	Analysis of the whole mixture over mercury.
Gas employed	100	100	100
Oxygen employed	100	100	100
Residue after detonation	,,	,,	49
Residue after the action of potassa	37.62	39	37

Now we see that 12 volumes of carbonic acid represent ..... 12 of oxygen.
Again, there is for residue .. 37 ,,
Then the oxygen consumed is equal to 51, which corresponds with .....102 hydrogen.

Thus the gas analysed was composed of 88 parts of hydrogen, and about 12 parts of a bi-hydrocarbon; it is at least a consequence to which the action of potassium in a state of fusion on this mixture has led me, since there remained, after the absorption of the hydrogen, the twelve parts of bicarburetted hydrogen already mentioned.

Before devoting myself to this kind of counterproof, I ascertained by synthetical experiments, that potassium in fusion has no action on marsh gas, olefiant gas, and oil gas. I saw that hydrogen mixed in known proportions with each of these gases, completely disappeared and left intact the portion of carburetted hydrogen associated with it.

All chemists who are familiar with the analyses of gas will agree, I think, that the application of this property of potassium so well observed by MM. Gay-Lussac and Thenard, and which may be said to have fallen into oblivion, should become a prompt and certain means of isolating hydrogen from a mixture of carburetted hydrogen gas and marsh gas. In this respect, therefore, we have made a step towards the solution of a problem which has baffled many analysts.

Every correction made, 100 grammes of anthracite yielded 24 lit. of this gaseous mixture, at 0° and 76, *i. e.*, in weight 2 gr., 14 of hydrogen.

ELEMENTARY ANALYSIS.		INDUSTRIAL ANALYSIS.	
Ashes	1.72	1.72 } coke	91.62
Carbon	90.58	89.90 }	
Hydrogen	5.60	24 litres of gas at 0° and 76	
Nitrogen	0.29	33.3 reduced lead.	
Oxygen	3.81	Traces of sulphur.	
	100.00		

II. Anthracite of Sablé.

Density = 1.75.

PHYSICAL PROPERTIES.—Endowed with great lustre; sometimes tarnished and faintly variegated; conchoïdal fracture; easily pulverised; its powder does not soil the fingers. This combustible burns without being divided, and without producing flame.

ANALYSIS OF THE FRACTIONED GASEOUS PRODUCT.

	I.	II.	III.	IV.	Total.
Gas employed	100	100	100	100	400
Oxygen employed	100	100	100	100	400
Residue after the detonation and action of potassa	19	39	48	52	158

	Calculated mean of partial analyses.	Analysis of the whole mixture over water.	Analysis of the whole mixture over mercury.
Gas employed	100	100	100
Oxygen employed	100	100	100
Residue after detonation	„	„	48
Residue after potassa	39.5	39	38

But 10 volumes of carbonic acid represent ..... 10 of oxygen
On the other hand, we have residue ..... 38 of oxygen
Then ..... 52 of oxygen consumed
And ..... 104 hydrogen corresponding.

Total 204

From the action of chlorine and potassium, it may be concluded that it was engaged in a mixture of 90 hydrogen and 10 of carburetted hydrogen.

Thus 100 grammes of anthracite yielded 19 lit. 66 of gas at 0° and 76, that is to say, 1gr. 75 hydrogen.

ELEMENTARY ANALYSIS.		INDUSTRIAL ANALYSIS.	
Ferruginous ashes	6.90	6.90 } 89.33 coke	
Carbon	87.22	82.43 }	
Hydrogen	2.49	19*lit.* 66 of gas (not luminous)	
Nitrogen	2.31	30.87 of reduced lead	
Oxygen	1.08	Small proportion of sulphur.	
	100.00		

III. Anthracite of Vizille.

Density = 1.73

PHYSICAL PROPERTIES.—Texture foliated, fracture rough; the broken parts are very much polished, shining, and rarely variegated. It is difficult to powder it on account of its hardness; its dust does not soil the fingers. It fractures in burning, and produces no flame.

ANALYSIS OF THE FRACTIONED GASEOUS PRODUCT.

	I.	II.	III.	Total.
Gas employed	100	100	100	300
Oxygen employed	100	100	100	300
Residue after detonation and the action of potassa	49	47	50	146

	Calculated mean of partial analyses.	Analysis of the whole mixture over water.	Analysis of the whole mixture over mercury.
Gas employed	100	100	100
Oxygen employed	100	100	100
Residue after detonation	..	..	50
Residue after potassa	48.66	49	49

1 volume of carbonic acid represents	1 of oxygen.
Adding the residue	49 of oxygen.
Then the	50 of oxygen consumed.
And	100 of hydrogen corresponding.
Total	200

These results being confirmed by the action of chlorine and of potassium on the gases, it must be admitted that the gas collected was only a mixture of 99 parts of hydrogen and 1 of carburetted hydrogen.

Thus 100gr. of anthracite gave 6 lit. 92 of gas at 0° and 76, that is to say, in weight, 0gr. 61 of hydrogen.

ELEMENTARY ANALYSIS.		INDUSTRIAL ANALYSIS.	
Ashes	1.90	1.90	88.33 coke.
Carbon	94.09	86.43	
Hydrogen	1.85	6*li.* 92 gas (not luminous)	
Nitrogen	2.85	31.8 reduced lead.	
Oxygen	0.00	Sulphur in appreciable quantity.	
	100.69		

IV. Anthracite of Isère, given by M. Regnault.

Density=1.65

PHYSICAL PROPERTY.—Foliated texture, rough fracture, the broken parts are shining and polished; combustion is difficult, without flame and without division of matter.

ANALYSIS OF THE FRACTIONED GASEOUS PRODUCT.

	I.	II.	III.	IV.	Total.
Gas employed	100	100	100	100	400
Oxygen employed	100	100	100	100	400
Residue after detonation and the action of potassa	48	48	50	60	206

	Calculated means of partial analyses.	Analysis of the total mixture over water.	Analysis of the total mixture over mercury.
Gas employed	100	100	100
Oxygen employed	100	100	100
Residue after detonation	..	..	58
Residue after potassa	51.5	52	52

Recapitulation made of 6 vol. of carbonic acid being equal to	6 of oxygen.
Residue	52 of oxygen.
Of	42 of oxygen consumed.
And of	84 hydrogen corresponding
Total	199.9

Whence it results, after testing the gas with chlorine and potassium, that a mixture of 94 parts of hydrogen and 6 of carburetted hydrogen had been analysed.

100 grammes of this anthracite furnished 16 lit. 99 of gas at 0° and 76, that is to say, in weight, 1gr. 5 of hydrogen.

ELEMENTARY ANALYSIS.		INDUSTRIAL ANALYSIS.	
Ashes	4	4	93.33 coke.
Carbon	94.0	89.33	
Hydrogen	1.49	16*li.* 99 of gas (not lighting.)	
Nitrogen	0.58	32.30 reduced lead.	
Oxygen	0.00	An appreciable quantity of sulphur.	
	100.07		

Before drawing conclusions, I may add a few words relative to the anthracite of Glamorganshire.

The quantity of gas which may be furnished by calcination in close vessels, being estimated at 240 lit., per kilogramme of combustible, it is evident that these results resemble those obtained in the large way, in gas houses, since from about 180, 200 to 250 lit., of gas may be collected from a kilogramme of pit-coal: it is true that the properties of the hydrogen are of no use; but it is certain that by means of steam directed on this combustible heated to redness, there is produced at Swansea, a gas possessed of great luminous power. The

purity of this anthracite is so great that when the operation has been properly conducted, there remains no carbonaceous matter in the retorts.

From the above, it is evident that a combustible whose mass would be presented, in all its parts of exploitation, with this homogeneity, would be a discovery of great value for the treatment of iron ores, and the quality of the products which result from them.

If, as I cannot doubt, certain very compact anthracites had been more or less suddenly cooled, after fusion, it may be conceived that the matter would have acquired a state of temper comparable to Rupert's drops, and that the least shock or the least elevation of temperature, would cause their dissemination. Indeed, this is what happens with a species of anthracite recently discovered on the left bank of the Seine, by a monk of Solem. When a blow is struck on one of the points of the most external bank of the anthracite, the neighbouring parts are reduced to dust: on account of this singular property, the workmen have given it the name of *anthracite mousseux*. It is not uncommon, on the contrary, to see anthracites with a foliated texture capable of supporting all changes of temperature, and of being used, either for the emission of gas, or for the penetration of air into their interior, during the whole of the combustion.

GENERAL TABLE OF THE ELEMENTARY COMPOSITION OF ANTHRACITES.

	Anthracite of Swansea.	Anthracite of Sable.	Anthracite of Vizelle.	Anthracite of Isere.
Carbon.....	90.58	87.22	94.09	94.00
Hydrogen	3.60	2.49	1.85	1.49
Nitrogen	0.29	2.31	2.85	0.58
Oxygen.....	3.81	1.08	0.00	0.00
Ashes.....	1.72	6.90	1.90	4.00
	100.00	100.00	100.69	100.07

A glance at the above table will show that several anthracites contain a proportion of carbon, of which the combustibles hitherto analysed have not presented any example.

In the second place, it may be remarked that all these samples heated, in close vessels, to a very high temperature, gave out a notable quantity of almost pure hydrogen.

This entirely unexpected result, if it were uniform in all anthracites, and I shall show that it is, would become a distinctive characteristic of this class of bodies.

Without the knowledge of this fact, it is very evident that the elementary analysis of anthracites ought to have led me to a confirmation of M. Regnault's experiments, and of the consequences which he has drawn from them, namely, that in descending from the modern alluvial soil to the tertiary and secondary ones, and those of transition, the combustibles belonging to these formations gain carbon, and diminish in hydrogen and oxygen. As to the production of hydrogen, I will try to explain it, allowing myself at once to be guided by the physical properties of the combustibles, their geological position, and the study which has been made of them, as well with respect to their composition, as with regard to the alteration which they undergo by distillation.

Thanks to the extreme delicacy of the analytical processes devised for the estimation of nitrogen, chemists, for the last few years, have been able to prove the presence of that element, in the organization of all vegetables; and, recapitulation being made of MM. Boussingault's and Payen's investigations, it is found that all herbaceous plants, in equal weights, contain much more nitrogen than the woods. These quantities amount on the average, in the former, to 2, 5, and 3 per cent. From some analyses made by MM. Regnault and Fikenscher, nitrogen would amount to 2.27 per cent. in turf, and to 2 per cent. in coal. Two of the anthracites which I have analysed are in this situation; often also, in most of the latter, not more than half per cent has been found.

Now, these variations, it must be admitted, are very slight, and consequently not sufficient for establishing a difference between the nature of the vegetables which have served as a basis for great formations of combustible, and that of the plants which compose the modern deposits.

I will by no means insist on the quantity of ashes left after the incineration of these carbonaceous matters, since it depends on the age of the vegetables, on the nature of the soil to which they were attached, and on the earthy substances with which they were impregnated after their death. If there were any identity in the mean composition of these debris of vegetables aggregated by time, it remains to be asked, what cause has impressed them with such different physical properties?

And at first it is known that the configur-

ation of anthracites, of pit coals, and of bituminous woods, is a very strong attestation of the degree of softening and fusion which these combustibles have undergone. The proof that these masses of combustibles must have undergone fusion, I very naturally draw from the geological classification generally admitted at the present day.

This anthracite abounds at the inferior part of the strata of transition; it composes more or less powerful beds, alternating with freestone, calcareous *jurassique*, pyrophoric rocks, and argillaceous schists. If, therefore, these rocks could be regarded as of igneous origin, it is evident that at the time of their effusion, the tertiary and intermediary soils which they passed through must have undergone great alterations.

But pit-coal commences at the superior portion of the soils of transition; it occupies especially the secondary soil, and may extend to the tertiary. Hence it follows that from the anthracite to the most distant boundaries of the pit-coal, there should exist a series of modifications, which necessarily relate to the action of decreasing temperatures.

To better illustrate my idea, I will compare the influence of igneous rocks on combustibles to the results obtained in our laboratories, by the distillation of these same bodies in close vessels. Indeed, towards the end of this decomposition, ordinarily only marsh gas mixed with hydrogen is obtained.

Now, the compact and homogeneous texture of certain anthracites denotes fusion; the nearly pure hydrogen which I collected indicates a decomposition of the same order.

At a less advanced period of the distillation, the temperature being less elevated, a portion of carbon, with the excess of hydrogen, produces liquid or solid hydrocarbons, which disperse when the apparatus is without pressure.

The same decompositions occurring in the coal pits, most frequently under the influence of a very strong pressure, one part of the combustible would be changed into dry coal, abandoning a certain quantity of hydrocarbons, which impregnate the superior layers, and remain intimately associated with them, if the temperature is sufficient for producing a commencement of fusion, and not too elevated, so as to drive the volatile matters to be lost beyond. Dry pit-coals, fat coals, and bituminous lignites, are in this situation, and give by distillation lighting gases, and tar charged with naphthaline.

As to the lignites, properly so called, and turf, which have not had to support these high temperatures, since there are still met with in them numerous traces of vegetation; they are essentially distinguished from the preceding combustibles, in yielding by distillation lighting gases and tar almost free from naphthaline, but charged, on the contrary, with acetic acid, paraffine, and eupione.

In order to give to these considerations all the character of truth, it remains for me to support them by experiments the object of which will be to isolate from the different combustibles, taken from various depths, the hydrocarbons of which I have spoken. I shall hasten to study this subject as soon as I have obtained the materials indispensable for such investigations.

ON THE COMPOSITION OF IODIDE OF NITROGEN.*

BY R. F. MARCHAND.

The author details the attempts he made to *directly* determine the composition of the iodide of nitrogen, which had not previously been done, even in M. Millon's work, in which that chemist endeavoured to show that the detonating compounds of chlorine, bromine, &c., contain hydrogen and should not be considered as binary compounds; but he admitted that he was able to arrive only at a very doubtful result, with respect to the proportion of hydrogen, by burning iodide of nitrogen with chromate of lead, the mixture having been made with the substances moistened, then dried in the combustion tube, by a current of air kept up for a long time.

M. Marchand therefore had recourse to an indirect method: he took iodide of nitrogen previously dried *in vacuo*, and he detonated it under a bell-glass: he points out the necessity of not employing too small a bell-glass, which would be broken by the violence of the shock. The experiment being dangerous, cannot be made with too many precautions. The iodide ought to be detonated several times, each time acting on about 0.05m. and at the same time covering the porcelain plate with the bell. Having collected a certain quantity of the deposit which was formed on the sides of the bell, the author examined it and found that it contained, without doubt, hydriodate of ammonia, which shows the existence of hydrogen in this compound.

The formula I^3, N^3, H^4, being besides quite as probable as $I^3 N$, the latter should be banished from chemical works.

Calculated in hundredths, the formulæ I^3, N^2, H^4, gives:—

I^3	1579.50	88.66
N^2	177.07	9.94
H^4	24.96	1.40
	1781.53	100.00

* *Erdmann's Journal*, vol. xix. p. 1.

It is evident how small the quantity of hydrogen is: we are not therefore surprised at the difficulty of ascertaining its proportion with certainty. The author, who is occupied with investigations concerning the detonating compounds, announces his intention of examining fulminating platinum, because he thinks this compound very likely to throw light on this class of substances, although it differs from these fulminating azotous compounds in its mode of preparation.

The author had commenced his investigations by the examination of fulminating gold: the analysis of this substance presented much difficulty and great danger; nevertheless, he ascertained that, conformably with M. Dumas' experiments, fulminating gold contains hydrogen. As to the presence or absence of oxygen, he could say nothing.

ON SEVERAL NITROUS COMBINATIONS: ON THE PRODUCTION OF CRYSTALLISED SULPHATE OF LEAD IN THE LEADEN CHAMBERS: AND ON THE EFFLORESCENCES ON WALLS.*

BY M. F. KUHLMANN.

In May, 1839, the author made known the existence of many combinations, which he had obtained by putting the oxides and acids of nitrogen in contact with the anhydrous acids, and especially sulphuric acid and the metallic chlorides. By pursuing these investigations, he was enabled to extend the square of these remarkable compounds by forming compounds analogous to fluoride of silicon. The following is a brief abstract of what he now acquaints us with.

Sulphuric acid enters directly into combination with deutoxide of nitrogen and nitrous, hyponitric and nitric acid, $N^2 O^5 + H^2 O$. M. Kuhlmann has not been able to obtain the direct combination of anhydrous nitric, with anhydrous sulphuric acid, but the affinity of anhydrous sulphuric acid for nitric acid, with one atom of water, is so great, that by placing nitric acid in a flask surrounded by a refrigerant mixture, and directing into it the vapor of sulphuric acid, the vapors of the nitric acid are absorbed into the retort containing the sulphuric acid, and the neck of the retort is covered with white crystals.

The various anhydrous compounds appear to give corresponding hydrated ones. The combination of $S O^3$ and $N^2 O^5 + H^2 O$, submitted to distillation, gave at first $N^2 O^4$, and much oxygen: by pursuing this distillation, there passed over a matter which solidified and formed white crystals in the neck of the retort, and all disengagement of hyponitric acid and oxygen ceased. The liquid in the retort was of a deep yellow, and became discolored by cooling: in contact with the air, it gave rise to a violent disengagement of deutoxide of nitrogen. It was no other than sulphate of deutoxide of nitrogen. The reaction seems to be explained by the decomposition, at a high temperature, of the nitric compound into a much more stable compound of deutoxide of nitrogen; hence the disengagement of oxygen.

Fluoride of boron and fluoride of silicon, in contact with deutoxide of nitrogen, and nitrous, hyponitric and nitric acids form corresponding compounds. The fluoride of boron, in particular, has a great affinity to the nitrous compounds. None of these compounds form any combination with the protoxide of nitrogen.

Fluoride of boron and fluoride of silicon, are absorbed in large quantity by concentrated nitric acid: these solutions give out white fumes: the action of water displaces boracic acid from the solution of fluoride of boron: the action of water does not give rise to the separation of silica, by acting with the fluoride of silicon. On saturating this second solution with the alkalis, silica is not precipitated, and the dissolved fluoride of silicon appears to enter into the composition of the saline matter obtained.

The compound of fluoride of boron and deutoxide of azote, appears to be the most stable; for, on heating the compounds of nitrous acid, oxygen is disengaged.

Perchloride of tin gives, with deutoxide of azote, a crystalline product, which easily distills, and is decomposed by water. Analogous products are obtained with chloride of tin and nitrous, hyponitric, and nitric acids; but the reaction of perchloride of tin on these acids, occasions an abundant disengagement of chlorine and hyponitric acid, and after the distillation there remains oxide of tin.

The most oxygenous nitrous compounds seem to be brought by heat to the state of combination with the deutoxide of nitrogen which presents the most stability of all the compounds in question.

The second communication of M. Kuhlmann, related to the crystals of artificial sulphate of lead, which he obtained in the manufacture of sulphuric acid.

Artificial sulphate of lead has hitherto been obtained only in the state of a white powder, without any crystalline appearance, whether prepared by the action of sulphuric acid on lead or its oxide, or by the decomposition of a salt of lead, dissolved in water by means of sulphuric acid, or a soluble sulphate. M. Kuhlmann has obtained the for-

* *L'Institut*; Nos. 373-4.

mation of crystallised artificial sulphate of lead, under the following circumstances.

With the view of obtaining a more complete condensation of the sulphuric acid formed in the leaden chambers, he caused the vapors formed of a mixture of sulphuric acid, hyponitric acid and water, to be circulated, on leaving the leaden chambers, in great leaden cases. In consequence of the previous condensation of the greater part of the sulphuric acid, hyponitric acid predominates in this mixture, and ought, consequently, in presence of the vapor, to give rise to a great quantity of nitric acid. It is under the influence of these corrosive vapors that the lead of the condensing cases becomes covered, in a few days, with a very thick layer of sulphate of lead, perfectly crystallised in needles and bracteæ, of a silky appearance, analagous to the crystals of chloride of lead.

The form of these crystals is very difficult to ascertain. It appears to resemble that of the native sulphate; they have a simple refraction, prisms are observed in them, terminated by pyramids and superposed rhomboïdal tables, retreating from one another. The salt is anhydrous, and it constitutes a neutral sulphate, perfectly pure, and not retaining any nitrous element. Its specific gravity is from 6·061 to 6·086.

The formation of crystallised sulphate of lead, under the influence of the nitrous vapors from the leaden chambers, almost freed from sulphuric acid, is so prompt and so abundant, that M. K. was obliged to give up this mode of condensation, and to effect it by other means.

The practical consequence of the facts observed is, that the preservation of the leaden chambers in the manufacture of sulphuric acid, is owing to the great excess of that acid in the nitrous vapor.

M. Kuhlmann's third communication relative to the efflorescences on walls, is as follows:

M. Kuhlmann proved that as there are formed in many circumstances efflorescences of nitrate of potassa and ammonia, the same also, under other circumstances, still more frequent, may be observed on walls, owing to carbonate and sulphate of soda: walls recently constructed with mortar and stones or bricks, give rise to exudations of caustic or carbonate of potassa, charged with the chlorides of potassium and sodium. The principal source of these salts of potassa and soda exists, according to M. Kuhlmann, in the lime used in building. He shows that many lime-stones contain chlorides of potassium and sodium, and particularly alkaline silicates which may give rise, under the influence of carbonate of lime, or quick lime, resulting from the calcination of those stones, to potassa and soda, either caustic or carbonated.

The examination of the efflorescences on the walls, has led M. Kuhlmann to examine coals, in order to ascertain what saline substances are associated with them. He has proved that the coals are often penetrated with a great quantity of carbonate of lime, combined with variable proportions of carbonate of magnesia. He ascertained that besides sulphate of iron, arising from the decomposition of the pyrites, there is formed on the surface of many pit coals efflorescences, owing to almost pure sulphate of soda, but without potassa. He has also detected, in these efflorescences, the existence of a small quantity of cobalt.

ACTION OF IODINE ON CHLORATE OF POTASSA.

BY M. E. MILLON.

Gay-Lussac, in his celebrated Memoir on iodine and its combinations, remarked that chlorine did not decompose the iodates. This fact might appear surprising at the time when the remarkable analogies between iodine and chlorine were discovered, and when it was seen that chlorine might be substituted for iodine, in equivalent proportion, throughout the long series of their combinations.

On reflecting on the comparative affinity of these two bodies, and on the complex manner in which it may be exercised in compounds of such a nature as the iodates and chlorates, I hoped to arrive at a substitution the inverse of that which is generally observed between chlorine and iodine. I caused iodine to act on chlorate of potassa, and the facts have answered in a decisive manner, which I think very remarkable.

Without heat there was no very sensible action between iodine and chlorate of potassa: but if on a determinate quantity of chlorate of potassa three or four times its weight of distilled water be poured, and the temperature raised to the boiling point, iodine added to this solution disappears in considerable quantity, although the liquor remains colorless. It remains colorless so long as, in adding the iodine, the equivalent proportion be not exceeded. When it has arrived at this extent, the liquid begins perceptibly to acquire a yellow, and then a brown color, and we obtain, as a final result, neutral iodate of potassa and chloride of iodine, containing a larger or smaller proportion of iodine.

If it be evaporated to dryness, chloride of iodine is disengaged, and pure iodate of potassa remains.

By stopping the action of the iodine on the chlorine before the proportion of an

* *Comptes Rendus*; No 5, Feb. 1, 1841.

equivalent of iodine was obtained, it was found that the liquor already contained the iodate formed, and chloride of iodine, doubtless corresponding to the iodic acid, for if it was very strongly heated, chlorine was disengaged, and there remained chloride of iodine, $I Cl^3$, which gave a precipitate of iodine, with carbonate of potassa.

The formation of chloride of iodine explains the reaction: the iodine combines with the chlorine of the chlorate, and thus leaving the chlorate, whilst the greater affinity of the iodine for the oxygen and the more considerable cohesion of the iodate, cause the iodine to enter into the chlorate in the place of the chlorine.

The reaction may be represented thus:—
$5 Cl O^5, K O + 6 I = 5 I O^5, K O + I Cl^6$.

This explanation seems to me to be confirmed also by the interesting modification which a few drops of acid, added to a mixture of chlorate of potassa and iodine, undergo by reaction.

My first idea was to facilitate the oxidation of the iodine by the presence of nitric acid; but I immediately perceived that a few drops of acid, added to a considerable quantity of iodine and chlorate, would be sufficient to set up a much more powerful action than that exerted between the iodine and the chlorate alone. Indeed, with this simple addition of acid, it suffices to commence the reaction by a gentle elevation of temperature, for it afterwards continues of itself; thus it proceeds until the liquor assumesa slight yellow umber tint; there is at the same time an abundant disengagement of chlorine, and by afterwards evaporating to dryness, very pure iodate of potassa is obtained.

It is evident that, in this latter reaction, the oxidation of the iodine is determined by the chloric acid set free by the nitric acid. Iodic acid is formed, which, carrying its action on a new quantity of chlorate, again eliminates chloric acid, and thus propagates the oxidation of the iodine and the elimination of the chloric acid, until all the chlorate is decomposed. What proves this curious mode of action is that the chloride of iodine, which is an essential product of the action of iodine on chlorate of potassa, is only an accidental product in the action carried on under the influence of nitric acid. The formation of this body may be almost entirely avoided by adding the iodine gradually: chloride of iodine is hardly formed, without the disengagement of chlorine is rapid. To avoid the formation chloride of iodine, the liquor must be kept boiling.

To prove the accuracy of these experiments I weighed 10 grammes of well-dried chlorate of potassa, which I treated by a sufficient quantity of iodine, under the influence of a few drops of nitric acid: I evaporated it to dryness. The dried and perfectly white product gave 17.3gr. of iodate of potassa. Theory indicates 17.4 gr.

To ascertain the purity of the iodate thus obtained, I decomposed by heat 1.805 of it: I obtained 1.389 gr. of iodide of potassium. Theory gives 1.399 gr.

Sulphuric and iodic acids answer as well as nitric acid for commencing the action.

This process certainly is the most simple and most expeditious for preparing iodate of potassa, which it yields perfectly pure. It is evident that the preparation of iodide of potassium might be thus arrived at; but before it can be economically used, the high price of chlorate of potassa, which is daily lowering, must yet be considerably reduced.

As to the reaction caused by the action of a few traces of acid, it reminds us, in mineral chemistry, of the curious phenomena of transformation by influence, which are frequently met with in organic chemistry. But—which has not always been the case in organised chemistry—the means by which the transformation is here operated, is followed up and may be readily understood.

ON THE ACTION OF METALLIC TIN ON SOLUTIONS OF MURIATE OF TIN.*

BY AUGUSTUS A. HAYES.

It has been long known to those who frequently dissolve tin in muriatic acid, that under some circumstances, the metal after it has been dissolved is precipitated. It sometimes presents large sections of octahedral crystals; at others, long prismatic needles, which are so arranged as to form skeletons of such sections. In this Journal, vol. xxvii, p. 255, Mr. W. W. Mather has described some experiments having a similar result. The interest which has been excited of late by notices of the non-action of metals in acid solutions and in relation to chemical action of a similar kind, has induced me to publish the facts which I sometime since observed.

When tin is dissolved in muriatic acid, either by gradual action under exposure to air, or by the aid of heat, a solution containing an excess of acid is obtained. This solution may be concentrated to a sp. gr. = 1·750, and retains its fluid form at or above 60° F. Although an excess of tin is present, the solution thus obtained is always acid. After decanting the clear solution, the tin used in excess with its impurities remains. Generally, after a few days' exposure, the matters left in the solution ves-

* *Silliman's Journal.*

sel change in appearance. The dull, corroded fragments of metal become frosted over, with bright needles of tin, and beautiful arborescent forms are seen. On studying the circumstances, I have found that the effect is due to electrical action. One portion of the undissolved tin, becoming a *positive* electrode, while another portion of the same mass assumes the state of a *negative* electrode, and precipitation of the dissolved tin takes place on it. Numerous cases of like action are known to chemists, where a part of a bar becomes indifferent to a concentrated solution, although a positive state is exhibited at another part, and active solution of the metal is taking place.

For the purposes of experiment, a solution of muriate of tin, of sp. gr. about 1·650, contained in a cylindrical vessel, may be carefully covered by half its volume of an acid solution of the same, having a sp. gr. about 1·20. The two fluids should not be mixed more than the slight diffusion which will take place. After placing a flat bar or plate in an inclined position, so that it passes through both solutions, the effects become immediately perceptible. That part of the bar which is within the diluted solution takes the *positive* state. A few minute bubbles of hydrogen form and escape, if the solution is quite acid. Precipitation of metallic tin commences near the line of contact of the two solutions, and extends throughout that part of the bar immersed in the denser solution. If the diluted solution is not rendered acid by the addition of acid, hydrogen is not perceived, and the action is more gradual. In either case the precipitation continues until the two fluids have attained the same electrical relation to the bar. If after the precipitation has ceased, water be carefully poured upon the surface of the fluid, it will form a stratum of very dilute solution. That part of the bar not before immersed takes the negative relation to this solution, and the same kind of precipitation follows as had taken place in the lower solution. The positive part of the bar, retains its state unaltered under the new conditions, and the line of separation is as clearly defined as in the first case. If a solution mixed with crystals be used, instead of a moderately concentrated solution, they are not decomposed under the above conditions. The presence of atmospheric oxygen has been supposed to influence this action. Such is not a correct statement; by exposure to atmospheric vapor, strong solutions of muriate of tin become weaker, and any masses of undissolved tin, projecting into the weaker solution, will decompose the denser solution below. In numerous trials, I have found all the cases of precipitation referable to different states of two solutions resting in contact.

REVIEWS.

Agricultural Chemistry. By the Rev. C. A. Lloyd. *Written and published at the request of the Members of the Shropshire Natural History Society, and delivered before them on the 3d of April,* 1840. Shrewsbury: G. Matthews, High Street, 1840.

A very able and instructive little pamphlet by a clergyman, who, not content with attention to the spiritual welfare of his flock, teaches them by what means to improve the benefits bestowed on them by the Almighty. In directing the attention of the agricultural population of his neighbourhood to the study of that branch of chemistry which is so intimately connected with their pursuits, Mr. Lloyd has conferred on them an everlasting benefit. We hope that his example will be followed by all clergymen in farming districts, to each of whom we would say—go thou and do likewise.

His remarks relative to the size of farms, are very worthy of attention, and we should be happy to transcribe them, did our space permit; as it is, we are forced to content ourselves with giving the following extract, as an example of the manner in which the author treats his subject:—

"Having briefly stated the condition of society which I think most favorable, and most unfavorable to a healthy state of agriculture, I shall now proceed to point out how I conceive our land may be made to bring forth an immense quantity of produce more than it does at present. The first question to be ascertained is, of what do the most fertile soils consist? and the next is, if it be possible to make other soils, which are less fertile, as productive as those which are so by nature?

"If I had a barren sand, like Bagshot heath, and which is of little value, how am I to proceed to improve it? To answer these questions I will state, that if any land is unproductive, the reason is, it is in want of one or two of the earths of which all the best soils are composed, namely, limestone, sand and clay. None of these earths by themselves will produce luxuriant vegetation, but when the three are *intimately* united together in the following proportions, namely, sand three-fifths, lime one-fifth, and clay one-fifth, then the mixture will produce good wheat and oats without any manure whatever, as I have seen by experiment. If this mixture was submitted to chemical analysis, it would be found to contain a much larger portion of silica than three-fifths, because common limestone and clay usually contain much silicious matter. The very stiffest clays do not contain more than 36 per cent. of alumina. If any person wishes to make the loam I have described

on a small scale, let him mix the three earths in the proportion mentioned. In order to do this, the clay should be tempered as for brick-making, and when quite soft, the lime and sand may be added, with as much water as to saturate it completely. In this state it should remain some hours, when the whole may be beaten as if it was mortar for building walls. It should then be left until the lime be carbonised from the atmosphere. When this has taken place it may be known by treating a small portion of the new made loam with muriatic acid. When it effervesces freely, then you may add manure, peat, or any animal or vegetable matter, as weeds, clippings of hedges, rubbish from hedge banks, and when these things are rotten, the soil will be fit for use, if the whole is sufficiently blended. The next step is to remove the soil from a certain portion of your garden to the depth of two or three feet, and to fill up the hole with the composition. Wheat, oats, mangel worzel, potatoes, and turnips, I have found to flourish in this soil; but some plants, as peas and beans, require soil of a greater age. As the three mentioned earths are all necessary to assist in forming soil, which will produce luxuriant vegetation, the Almighty Disposer of all things has given a great abundance of them to mankind. I shall speak of each of them. The whole three, when pure, appear white, resembling whiting. Pure clay is called by the chemists alumina, and was proved by Sir H. Davy, to be an oxide of a metal now named aluminum. Alumina is one of the most abundant productions of nature; it is found in every part of the world; in rocks, mountains, and alluvial depositions. The clay of which bricks and earthenware are made, is in a greater or less degree of purity. The more clay contracts in baking, the greater quantity of alumina it contains. Alumina is sometimes found crystallised, as the ruby and sapphire, two of the most beautiful of precious stones. Pure alumina is prepared from alum, by mixing the alum with potash in hot water, and after a few minutes the alumina is collected on a filter, and washed with hot water.

"Alumina has neither taste nor smell, and is insoluble in water, and does not enter into the composition of either animal or vegetable bodies. It is of great use in soils to give them consistence, without which trees and plants would be blown down by the wind; it also makes the ground more retentive of moisture and manure.

"Pure sand is called silica, or oxide of silicon, a substance analogous to carbon and boron. Silica exists in great abundance in quartz, sandstones, and rock crystal, and in the common sorts of lime-stone. It is a large ingredient of very many minerals, including the hardest gems and the softest clays. It enters into the composition of about two-thirds of the whole number of minerals whose nature is known.

"No one is ignorant to what an extent it is found on the sea-shore, and that God has placed it as a barrier against the raging of the impetuous ocean. It is esteemed by some to be the most abundant substance in nature, and it ought to be the most abundant substance in all soils which deserve to be called fertile.

"Silicious earth, of sufficient purity for most purposes, may be obtained by heating transparent specimens of rock-crystal, and then reducing them to powder. Pure silica, in this state, is a light white powder and is without taste or smell, and melts with difficulty. It fuses with potash and soda and forms glass.

"Lime is an oxide of a metal called calcium, discovered by Sir H. Davy. Lime commonly exists in nature united with carbonic acid, and in this state it forms lime-rocks and all the various kinds of marble. Carbonate of lime exists in the greatest purity in Iceland spar and Carara marble. When lime-stone is heated red hot, the acid is driven into the air, and what is commonly called quicklime remains. It melts with great difficulty.

"It has a strong affinity for water, with which it unites with a great heat, forming what is called slacked lime, or hydrate of lime. Hydrate of lime dissolves sparingly in water, but it is a curious fact that water of 32 Fahrenheit, is capable of dissolving twice as much of it as when the water is at the boiling points. Carbonate of lime exists in great profusion in nature, in lime rocks, in chalk beds, and in marl, which latter is a natural mixture of carbonate of lime and clay.

"The greatest ignorance of the nature of limestone existed until the year 1755, when the celebrated Doctor Black, proved that it consisted of an earth and an aërial acid, now called carbonate acid. Carbonic of lime is a necessary ingredient in all fertile soils. Quick-lime acts as a stimulus on the animal and vegetable matter in soils. Dr. Tenant, the Professor of Chemistry at Cambridge, discovered that some lime-stones contain magnesia, and that calcined magnesia is injurious to vegetation, but this was not the case when the earth was in the state of carbonate. In some places the turnpike-roads are mended with lime-stones; when this is the case, the road scrapings must be very valuable either on clay or sandy soils which may be deficient in calcareous matter.

"Now all these three earths, however useful they are when intimately united together in proper proportions, are quite use-

less, as to vegetation, when by themselves, and no soil is productive that contains nineteen parts out of twenty of any of the three earths mentioned. If persons are desirous of improving their lands permanently, this is only to be done by carrying that earth into their fields in which their lands are most deficient by nature. Thus, if land be a stiff clay, it will be improved permanently by carrying sand, peat, and lime, or coal-ashes to it; or, on the other hand, if it be sand, then clay, marl, or lime may be added, as most convenient. It is quite a common practice in Norfolk, for farmers to carry subsoils upon their lands, and this is done to a very great extent at the expense of sixpence per cubic yard, or thirty shillings for a hundred cubic yards. Sir H. Davy, in his book on Agricultural Chemistry, has given an analysis of several rich soils from various parts of the kingdom; and in all cases, each of the three mentioned have formed considerable portions of the soil."

In conclusion, the limited space which can be afforded to a review, does not admit of our giving any very accurate idea of such a work as that before us: we therefore recommend our readers to procure it and judge for themselves.

Instructions for the Discrimination of Minerals by Simple Chemical Experiments. By FRANZ VON KOBELL, Professor of Mineralogy in the University of Munich. Translated from the German, by ROBERT CORBET CAMPBELL.—Glasgow: Richard Griffin and Co., and Thomas Tegg, London, 1841. GRIFFIN'S MISCELLANY, No. V.

This work, from its comprehensiveness, as well as from its very condensed form, is eminently worthy of the attention of the mineralogist, whether he be a mere beginner or an adept in that beautiful science.

We look upon it as a very valuable and useful addition to mineralogical literature, and we advise our readers speedily to possess themselves of it, and to give it an attentive perusal.

To the practical mineralogist, it will be found of great utility as a book of every-day reference.

The author divides minerals into two classes—minerals with metallic lustre, and with non-metallic lustre. Those which have an imperfect metallic lustre, belong to the first class, when quite opaque; and to the second "when translucent on the edges." He divides each class into three orders, as follows:—

CLASS I.—MINERALS WITH METALLIC LUSTRE.

O. Metals easily distinguishable by their physical properties.

A. Fusible, 1—5, or else readily volatile.

B. Infusible, or fusibility above 5, and non-volatile.

CLASS II.—MINERALS WITH NON-METALLIC LUSTRE.

A. *BB, easily volatile or combustible.

B. BB, fusible, 1—5, but not, or only partially, volatile.

C. BB, infusible, or fusibility exceeding 5.

Each of these orders is again sub-divided; but space will not admit of our going farther into the details of the classification: we therefore select the following as a specimen.

NATIVE METALS EASILY DISTINGUISHED BY THEIR PHYSICAL PROPERTIES.

Native Mercury, Hg. Gediegen Queck-silber.

Liquid at common temperatures; of a tin white color.

Native Silver, Ag. Gediegen Silber.

Silver-white, perfectly malleable, easily soluble in nitric acid; the solution treated with muriatic acid gives a curdy white precipitate, which rapidly changes color when exposed to the light, becoming first grey, and then black. H. 2,5.

Native Gold. Au. Gediegen Gold.

Argentiferous gold.—Ag+$_x$Au. Electrum. Goldsilber. Possess more or less golden yellow color, and are perfectly malleable. *Native gold* dissolves only in aqua regia. (Nitric and muriatic acids mixed together,) and leaves scarcely any residue. *Argentiferous gold* is wholly or partially decomposed by aqua regia, under separation of chloride of silver. The solutions of both give, with protosulphate of iron, a reddish brown precipitate of gold, to which friction communicates a metallic lustre, and the yellow color of gold.

Native Copper, Cu. Gediegen Kupfer.

Of copper-red color, ductile and malleable; soluble in nitric acid, giving an azure blue solution.

Native Lead, Pb. Gediegen Blei.

Of lead-grey color, ductile and malleable; BB, easily fusible; smokes and deposits on the charcoal a greenish yellow sublimate, soluble in diluted nitric acid; the solution affords, with sulphuric acid, an abundant white precipitate. H. 1, 5.

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* BB. signifies *Before the Blowpipe.*

Native Platinum, Pt. Gediegen Platin.
Palladium, ...Pd.

Both ductile and malleable; both infusible. Platinum is of a steel grey colour, not soluble in nitric acid, but dissolves when digested in aqua regia. Palladium possesses a color between steel-grey and silver-white, is dissolved by nitric acid, but more easily by aqua regia. The solution of platinum gives, with carbonate of potash, a yellow precipitate, insoluble in excess; that of palladium gives with carbonate of potash a brownish precipitate soluble in excess.

Native Iron, Fe. Gediegen Eisem.

Ductile and malleable; light steel grey; attracted by the magnet; infusible; easily soluble in muriatic acid.

A. FUSIBLE, 1—5, OR EASILY VOLATILISED.

A. 1. BB. *in charcoal, produce a strong odour of arsenic.*

Native Arsenic.=As. Gediegen Arsenik.
Arsenic Glance.=As. Arsenikglanz.

BB, volatilise without fusing; sublime in a bulb tube as a metallic greyish-white crystalline crust. *Arsenic Glance*, BB, takes fire, and continues to burn with a continuance of the blast; gives a grey arsenical smoke, and becomes covered with crystals of arsenious acid. *Native Arsenic* ceases to burn on being taken from the blowpipe flame.

Arsenical Grey Copper =Fe Zn Cu Sb As S_x, Arsenik fahlerz.

Palybasite =Cu Ag Sb As S_x

BB. on charcoal, fused and then moistened with muriatic acid, they communicated to the flame a beautiful blue colour. *Polybasite* gives, with soda and borax, a button of silver, which, by fusion with borax, may be procured quite free from copper. *Grey Copper*, treated in this way, gives with difficulty a button of copper only. The copper is more easily extracted by fusing the mineral with lead and boracic acid. The partial solution of grey copper in nitric acid gives, with muriatic acid, little or no precipitate; the solution of Polybasite gives an abundant precipitate of chloride of silver. Both the minerals yield sulphuret of arsenic, and sulphuret of antimony, to a solution of caustic potash; and, on the addition of muriatic acid to the solution, these substances are precipitated in lemon-yellow flocks. (When the sulphuret of antimony is in excess, the flocks are yellowish red.) *Grey Copper* has a steel-grey color. *Polybasite*, an iron-black color. The hardness of the first is 3.5, that last 2.5.

Tin-white Cobalt =Co As_2. Speiskobalt.

Bright white Cobalt=Co. As_2 + Co S_2. Glanskobalt.

BB. communicate to borax a beautiful sapphire-blue color, although present in a very minute quantity; they are dissolved by concentrated nitric acid, under separation of arsenious acid. The solution generally possesses a rose-red colour. Silicate of potash, added to a much diluted solution, gives it a sky-blue color, or produces a blue precipitate. Chloride of barium produces in the solution of *Bright White Cobalt*, an abundant white precipitate; in that of *Tin White Cobalt* no precipitate, or only a very slight one. The color of *Tin White Cobalt* is from tin-white to light-steel grey; that of *Bright White Cobalt* is reddish silver-white.

Compare with the following substances:—

Red Arsenical Nickel = Ni As. Rothnickelkies.

White Arsenical Nickel=Ni. As_2 Weissnickelkies.

Nickel Glance = Ni S_2 + Ni As_2 Nickelarsenikglanz.

Give with nitric acid an apple-green solution. By adding to this a solution of chloride of lime till a precipitate begins to be formed, and then caustic ammonia in excess, a sapphire-blue solution is obtained. Caustic potash and silicate of potash produce in the nitric acid solution greenish precipitates. Chloride of barium produces an abundant precipitate in the solution of *Nickel Glance*, but none in the solution of the two other minerals.

All those substances commonly afford indications of cobalt before the blowpipe. The color of *Red Arsenical Nickel* is light copper; that of *White Arsenical Nickel* is tin white; that of *Nickel Glance* light lead grey, approaching to tin white.

See Sulpho-Antimonite of Neckel, under A 4.

Arsenical Iron = Fe S_2 + Te As_2 Arsenikkies.

BB. in a bulb tube, gives a sublimate of metallic arsenic, and then fuses to a black red, which, after a long continuance of the blast, becomes magnetic.* It is soluble in nitric, under separation of sulphur and arsenious acid. The solution gives with caustic ammonia, and potash, a reddish-yellow precipitate. The mineral communicates to borax the green color which indicates the oxide of iron. The fresh fracture is silver white, somewhat inclining to grey, sp. gr. 6.

See Native Bismuth, A 6, which often contains Arsenic.

A 2. BB. *charcoal, or an open glass tube, exhale the strong odour of horse radish, which distinguishes Selenium.*

* *Axotomous Arsenial Iron* = Fe $As.^2$ Mispickel acts in like manner, but after the arsenic is driven off, it fuses with difficulty, and only imperfectly on the surface. Sp. gr. 7.2.

Seleniuret of Mercury = $H_g Se_x$. Selenqueckailber.

Seleniuret of Mercurcy and Lead = 3 Pb Se + H_g Selenqueckailberblei.

When heated with soda in the bulb tube, they give metallic mercury. The double seleniuret, heated with soda and charcoal, gives grains of lead; *Seleniuret of Mercury* gives none. Both vaporise readily; *Seleniuret of Mercury* after fusion; the double *Seleniuret* without fusion. The color of the first is between steel-grey and dark-lead grey; that of the last is lead-grey.

Seleniuret of Lead = Pb Se. Selenblei.

BB. volatilises almost entirely without fusing, and coats the charcoal at first with a slight metallic grey, and, afterwards with a white and greenish-yellow sublimate. With soda it gives grains of lead, but not without difficulty. The solution in nitric acid gives a white precipitate with sulphuric acid. Color, lead-grey.

Seleniuret of Silver = Ag Se. Selensilber.

BB. fusion easy; quiet in the outer flame, but with intumescence in the inner; gives, with borax, a button of pure silver; dissolves in concentrated nitric acid. The solution, treated with muriatic acid, gives an abundant white precipitate of chloride of silver. Color iron-black.

Seleniuret of Copper = Cu_2 Se. Selenkupfer.

Seleniuret of Lead and Copper = Pb Se + Cu Se. Selenbleikupfer.

Eukairite = Cu_2 Se + Ag Se. Selenkupfersilber.

All fuse on charcoal to a metallic button, which, moistened with muriatic acid, tinges the flame of a beautiful color. They dissolve in concentrated nitric acid; the solution treated with ammonia in excess acquires an azure-blue color. The solution of *Eukairite* gives, with muriatic acid, a copious precipitate of chloride of silver; that of the *Seleniuret of Lead and Copper* gives, with sulphuric acid, a white precipitate of sulphate of lead; that of the *Seleniuret of Copper* gives no precipitate with these two acids. The color of *Seleniuret of Copper* is silver-white; that of *Eukairete*, and that of the *Seleniuret of Lead and Copper* is lead-grey.

We may conclude by recommending this work to all who are desirous of becoming acquainted with the characteristics of minerals, the instructions given for their discrimination being very complete.

MR. MORTON'S GALVANO-ARSENICAL APPARATUS.

To the Editors of the Chemist.

GENTLEMEN,

In your March number I perceive you have done me the honor to insert a notice of a Galvano-Arsenical Apparatus* of mine, copied from the *Inventors' Advocate*, where, unfortunately, the name of MARTIN is introduced for that of MORTON.

Since it was shewn at the ROYAL INSTITUTION, I have been induced to simplify it, by employing one tube only, which, being increased in size, I am enabled to collect a larger quantity of gas; for, when organic fluids are being decomposed by it, I find that much froth is formed, which, rising into the jet, interferes with the combustion of the gas. By rest, however, this falls.

The only objection to this alteration is, that the analyst must be careful to connect the gas receiver with the negative electrode of the battery, or the arseniuretted hydrogen evolved will escape.

I am, respectfully yours,

W. J. T. MORTON.

Royal Veterinary College,
March 23, 1841.

NEW COMPOUND FORMED WITH IODINE.

To the Editors of The Chemist.

Into a flask having its neck lengthened with a glass tube to prevent the escape of iodine vapour, I put one ounce of iodine, and gradually poured two ounces and a half of oil of turpentine. A violent action instantly took place, with intense heat; as soon as the mixture had become cool, it was put into a glass retort, with a receiver kept very cold. The heat of a lamp being applied, and keeping the mixture under the boiling point, an exceedingly dense fluid came over, having a suffocating vapor. The distillation was carried on until the vapor assumed an oily appearance. The lamp being then removed, a few ounces of distilled water was put into the receiver, which took up a deep red color, containing a portion of uncombined iodine and a powerful acid; this being separated from the insoluble part and filtered, was put into a retort; a gentle heat being applied for a short time, a few small shining crystals of a copper color† floated in the solution which deposited on cooling.

These crystals being collected on a filter, the solution was again put into a retort until one half was distilled over, and finding that no crystallization took place, I thought it necessary to separate the free iodine with starch. This being done, the distillation was carried on in a water bath till nitric acid precipitated iodine from the fluid distilled

* See THE CHEMIST, No. XV., p. 76.

† I have since obtained these crystals of a yellow color.

over, but no more crystals were deposited although frequently allowed to cool.

The acid thus obtained in the retort being highly concentrated, had suffered a little decomposition, and consequently contained a portion of free iodine. When the acid was diluted with water, a small quantity of a chrome yellow powder was precipitated. The liquid acid unites with the alkaline carbonates with effervescence.

The crystals obtained in the first part of the process were insoluble in cold, but soluble in hot water, and the solution reddened litmus paper. In the first retort a resinous mass, resembling the extract of copaiba was left, which being distilled to dryness in a sand bath, gave at first a liquid resin like the balsam of copaiba, but at the latter part of the distillation, a soft resin, and the product in the retort a carbonaceous mass, mingled with a little resin, incapable of being distilled. The resin and balsam thus obtained were soluble in ether and turpentine, but not possessing the smell of the latter.

I took six drops of the balsam in a little water, which acted as a decided diuretic.

I am, Gentlemen,
Your obedient servant,
HENRY OSBORN.

EXPERIMENTS ON THE CARBONATE OF SILVER.

To the Editors of The Chemist.

GENTLEMEN,

The following experiments on the carbonate of silver, were performed with a view of ascertaining what changes take place by exposing this carbonate to solar light, and as they appear to illustrate the matter, perhaps an account of them may not be uninteresting to the readers of "THE CHEMIST."

A quantity of carbonate of silver was suffered to remain for many weeks in such a situation that the light of the sun might act on it, during which time it was frequently stirred: it became of a black hue throughout.

A portion of this blackened carbonate of silver was placed in a glass, and an excess of acetic acid poured on it, a brisk effervescence ensued; when the whole of the carbonate was dissolved, there still remained a black powder, which being washed, was found to be unalterable in either sulphuric or muriatic acids, but was attacked with violence and dissolved by the nitric acid, from which nitric solution, muriatic acid precipitated chloride of silver.

As I happened to discover that the carbonate of silver is very soluble in either liquid ammonia, or a solution of the carbonate of ammonia, the experiment was varied, by adding liquid ammonia to the blackened carbonate instead of acetic acid; the result perfectly agreed with what has been before stated.

This black powder, by being heated, put on the appearance of metallic silver, and the same black powder was produced by leaving a plate of zinc, immersed in moist carbonate of silver.

Now, from these experiments, I think that it may be fairly concluded, that solar light reduces carbonate of silver to the metallic state. I am, Gentlemen,

Your obedient servant,
REUBEN PHILLIPS.

ON DECOMPOSITION BY HEAT.

To the Editors of The Chemist.

GENTLEMEN,

The generality of substances, susceptible of decomposition by heat, undergo no change of constitution unless the temperature be raised to a certain point, when it begins, and is completely finished, without any farther increase of temperature.

There is, however, a class of bodies, which appear to be decomposed in an irregular, and uncertain manner: for example, if the moist hydrate of alumina be dried in a steam heat it will retain an equivalent of water; if the heat be increased, some of this water will separate; but it requires a very intense heat to drive off the whole of it. Instances of this nature are not rare: we obtain precisely the same results with hydrated peroxide of iron: if this body be heated in a glass tube, over an argand flame, much of the water will condense in the tube, but it takes a red heat to deprive the oxide of the whole of its water.

The same effects are produced by heat on crystallized boracic acid and borate of soda; and, no doubt, are common to a great variety of substances.

If carburetted hydrogen be exposed to a gradually increasing heat, it will deposit successive portions of carbon; but no degree of heat to which we can expose it, will effect its entire decomposition.

We obtain these remarkable phenomena only when one of the combined bodies is strongly disposed to assume the gaseous state, and when the other is comparatively fixed.

These decompositions cannot be owing to the mutual repulsion of the two bodies, for then the substance ought to be entirely resolved into its components. Since, therefore, it cannot be owing to a reciprocal action, the effect must be ascribed to the particles of the most volatile body repelling each other out of the sphere of the mutual attraction subsisting between them and the

denser body. For example, take the hydrate of alumina: here, we may suppose the atoms of water to be approximated so closely together, that a slight increase of heat causes them to repel one another; if the heat be not sufficiently strong, the disposition of the water to become gaseous, is counterbalanced by the attraction subsisting between it and the alumina; but when the heat is so far increased that the repulsion between the atoms of water is greater than the mutual attraction of the water and the alumina, part of the water flies off, and continues to do so, until the atoms of water stand so far apart, that the repulsive energy is overpowered by the attraction between the water and the alumina. Supposing, for instance that one half of the water has been dissipated, there is no necessity for imagining that the half equivalent of water unites with the equivalent of alumina: the combination may still be an equivalent of water, to its equivalent of alumina; except that now the atoms of water are so far separated that the mutual attraction preponderates.

A complete decomposition by heat can never be accomplished unless the components of the body mutually repel each other, which can generally be effected by a due increase of caloric. I am, Gentlemen,

Your obedient servant,

JOHN VIPER.

II. CHEMICAL MANUFACTURES.

NEW INVESTIGATIONS CONCERNING THE PRESERVATION OF WOOD.*

BY DR. A. BOUCHIERE.

THE kindness with which the Academy looked upon the work on the preservation of wood,† which I lately had the honor of submitting to it, encourages me to present to it some new studies on the same subject, which appear to me worthy of attention, as well on account of the practical applications which flow from them, as for the new experimental ways which they present to the progress of vegetable physiology.

This new work was undertaken more than a year ago, in order to resolve a serious difficulty presented by the application of the process of the penetration of wood by vital aspiration. The process, indeed, can be executed only in the sap season, and, besides that this is limited to a few months in the year, the cutting of wood at this period is contrary to established practice, and leaves in many minds the conviction —doubtless an ill-founded one— that wood must be very alterable when not cut down in winter.

To overcome these obstacles to the admission of my processes on the large scale, I applied myself to finding out a means of economically penetrating wood in winter, and, as fortunate in the second work as in the former one, I have discovered a mode of penetration different from that of vital aspiration, as economical and complete, by means of which, *I can, in the depth of winter, and in a very short space of time, penetrate all rough or squared wood.*

This process which M. Biot might have been led, by his experiments, to discover before me, if he were occupied with the same question, applies only to wood newly cut down and divided into pieces of all lengths, according to necessity. To impregnate these pieces with different liquors, it is sufficient to place them in a vertical position, and to adapt to their upper extremity, bags of impermeable linen acting as a reservoir, into which the saline solutions, or others chosen in order to give the wood new qualities, are from time to time poured. In most cases, the liquid promptly penetrates by the superior extremity, and almost immediately the sap flows. With some woods which contain a great quantity of gas, this flowing does not commence until the gases are expelled, and then the sap falls without interruption. The operation is terminated when, at the inferior extremity of these pieces of wood, liquors identical with these poured in at the top can be obtained.

In the course of the experiments which I have made with this mode of penetration, I have observed many very curious facts, which have furnished me with the materials for a more extensive work with which I am occupied; I will now confine myself to mentioning those which appear to me the most interesting.

I. It is interesting to extract the sap of almost all woods by thousands of litres; this operation is executed without expense and in a very short time; *in one single day, I have been able to collect* 4850 *litres. I operated on seven trees, and was assisted by two men.*

II. Not only can the saccharine and mucilaginous matters, &c., held in solution by the sap, be extracted, but it is also possible to procure from it the colored resinous juices, &c., which it contains; to

* *Comptes Rendus*, No. 7, 15th Feb. 1841.

† For which, see THE CHEMIST, No. VII. p. 205.

obtain this result, it is sufficient to previously impregnate the trees with liquids having the power of dissolving those juices. After a maceration of some time, if I may so speak, the artificial sap which is expelled is found charged with those matters. In one case as in the other, these juices may be turned to great advantage.

III. Thus it is discovered, I think, but without acting on masses as I have been able to do, that the sap of the periphery of wood, and that of the central parts present some differences. The more or less elevated points of the stem from which it is collected, the age of the vegetables and the period of the year at which the operation is performed, also exert their influence on the composition presented.

IV. In most cases the sap contains only some thousandths of solid matter, although the wood contains several hundredths of soluble matter. This fact points out investigations which may be highly interesting to vegetable physiology: nothing better demonstrates the vascularity of the ligneous system.

V. Woods contain different proportions of gas whose composition varies according to species, age, and the seasons. I have ascertained that in some cases these gases represent the twentieth of the cube of wood.

VI. In the course of my experiments, I have been very well able to appreciate that the contractility of the vessels of wood under the influence of certain agents, was not the same, and that whilst such a species would be perfectly penetrated by the neutral liquor A., and by the astringent liquor B., another species would admit only the liquor A. This observation is of great practical importance.

VII. The lightest woods are not those which are most easily penetrated, as one would be inclined to think. The poplar resists more than the beach or the yoke-elm, and the willow more than the pear-tree, the maple and the plane.

ON THE DECOMPOSITION OF OILS IN CLOSE VESSELS.*

BY M. BLONDEAU DE CAROLLES.

When oils, whether mineral or vegetable, are decomposed in close vessels, an abundant deposit of black matter is observed, which has been taken for finely divided carbon arising from the decomposition of carburetted hydrogen or volatile carburets under the influence of a high temperature. This phenomenon is not observed in the composition of M. Selligue's gas (see *The Chemist*, Nos. 7 and 8), which is composed, as is known, of the mixture of gases arising from the simultaneous decomposition of water and schists.

A few experiments have enabled me to account for this fact, which, previously, was not satisfactorily explained.

When bicarburetted hydrogen, or a volatile carburet, such as oil of naphtha, is passed into an iron tube, the temperature of which is nearly white heat, there is formed in its interior, a black deposit, which is not carbon, but a *carburet of iron*.

When a volatile oil and steam are simultaneously passed into this tube, there is a production of gas, arising at once from the decomposition of both the oil and the water, but there is no carbonaceous deposit.

The explanation of these facts is simple: iron, at the heat at which the operation is effected, can decompose the hydro-carbons and water; but having a greater affinity for the oxygen than for the carbon, both of which are in contact with it, it in preference combines with the oxygen, and exerts no action on the hydrocarbon.

According to that, it is evident that in M. Selligue's process, all the oil used is converted into carburetted hydrogen; which, not having lost any carbon, ought to possess a greater luminous property than that obtained by decomposing schist, without the presence of water.

The deposit of *carburet of iron*, which is obtained when oil of resin is employed, is so abundant, that the coke over which the decomposition is operated is obliged to be renewed every twelve hours, and if it be wished to collect it, it may be sold in great quantities in commerce, as lamp black.

I have several times analysed this carburet of iron, and I found that it was formed of 90·17 carbon and 9·83 iron. This is the composition assigned to *plombagine*, which since has been regarded as pure carbon.

The following are the inferences which I draw from the facts mentioned in this note:—

I. *Plombagine* really exists, but not in the circumstances which have been admitted; it is produced with great facility when red-hot iron is put in contact with carburetted hydrogen, or a volatile carburet, and it is formed in great abundance in the manufacture of gas from resin.

II. The production of this substance may be prevented by decomposing the oil and steam simultaneously.

The latter observation may become of practical utility, for we can, by driving into the distillatory apparatus a small quantity of steam, prevent the formation of plombagine, thus saving the interior of the vessels from deterioration, preventing stoppages, and preserving to the gas all the carbon which ought to enter into its composition, and which is useful to its luminous power.

* *Comptes Rendus, No.* 7; *15th Feb.* 1841.

ON A NEW EMPLOYMENT OF THE GALVANIC PRECIPITATION OF COPPER FOR MULTIPLYING PICTURES MADE AFTER THE MANNER OF INDIAN-INK.*

BY HERR FRANZ VON KOBELL.

The galvanic precipitation of copper, which, by the experiments of M. Jacobi, has already given such interesting and extraordinary results to the arts, has led the author to make some experiments of a new kind, with the view of depositing on a monochromatic drawing, a plate of copper, in order afterwards to employ it for impression. It may be foreseen that, if the surface of the picture could be made to conduct, there certainly would be formed a solid deposit of copper; but the kind of painting which always requires a fatty substance does not give a conducting color, and the method indicated by M. Jacobi, of rubbing over the surface with a lead pencil, with graphite, or any other similar conducting substance, cannot here be employed without spoiling the soft and light shades of the images.

Herr Von Kobell, therefore, sought to cover with copper, without this means, an image painted on silver. He immediately understood that time alone was required for the non-conducting parts, intermixed with, and surrounded by others which were good ones, to be covered also. The experiment answered, and drawings made with wax, varnish, chemical ink, &c., were often covered in a very short time, without having been made conductors. It might often be observed how, in the midst of a non-conducting surface which covers the whole of the plate, small globules of copper were very soon formed, and how, by the aggregation of a few fillets, these globules gradually united. As it always requires about four or five days before a plate sufficiently thick for impression can be obtained, it is so much the less necessary to render the color a conductor, for the fine shades or the lighter parts are not ordinarily quite covered until the second day, and there remains only a few free places which may then, to hasten the final operation, be covered with a good lead pencil, which may be done without injuring the drawing. Before doing this, the plate must be dried with filtering paper.

As to the manner of executing the picture which it is wished afterwards to copy, it is necessary that it should be made on a polished plate of silver or copper.† The picture is monochromatic, and is made with the thick oil used by painters on porcelain, and which remains as a residue after the evaporation of turpentine. It is mixed with iron rust, and used as in painting on porcelain. A good color, which dries quickly, may also be obtained by means of a solution of Dammara wax in turpentine, to which is added iron rust, mineral black, or something similar.

It is evident that in this monochromatic picture the diversity of the tints is produced only by the different thicknesses of the color applied to the plate of silver, so that the lights are given by the metallic surface, and the demi-tints and shades by greater or less thickness of color.

Moreover, it is not required to be very thick: on the contrary, the more fine and delicate the image is, the better is the plate of copper, and the quicker, also, is it formed. The color once dried should adhere to the plate, for without that there would be deposited under it a thin layer of copper, which could be removed only by means of nitric acid.

In some experiments, the author mixed formiate of silver with the color, and then gently heated the plate: there was thus formed on the surface, points of reduced silver, good conductors, which hastened the the deposition; but as has been said above, this addition is not necessary.

As regards the precipitation of the copper, M. Jacobi's apparatus may be used, or else a copper trough with a square of parchment, such as Steinheil constructed according to Daniel's method, or else the apparatus described by Mr. Spencer.

The employment of M. Jacobi's apparatus presents the inconvenience of the borders of the plate, by the effect of the continued action, increasing much in thickness, and forming, especially at the angles, thick *pads*. Besides, if this plate be not often turned, it does not acquire an equal thickness, and a certain degree of skill is required to prevent the vegetations which have a tendency to be formed. A copper trough is convenient, but it becomes covered with copper by frequent use, which causes it to require recasting, on account of the inequalities which are gradually formed in it. There is also deposited more copper than is necessary. An apparatus which Herr Von Kobell used with advantage, consists of a glass or porcelain vessel with a flat bottom, the edges of which are two or three inches in height. At the bottom of this vessel is placed a plate of copper, to which is rivetted, for a conductor, a strip of half an inch in breadth, but at a right angle. This strip is isolated with wax, except at the upper part.

The plate should be large enough to pass by about half an inch round the drawing

* *Journal für prakt. Chemie*, 1840.

† On copper it may be drawn with a pen with a solution of persulphuret of potassium. The black marks may be washed off while wet, and the drawing remains visible by a kind of corrosion.

which is placed underneath. On the plates is placed a stretched sheet of parchment, which rests on three feet, of a quarter of an inch in height, or else a *tambourine*, in which is put a plate of amalgamated zinc, which is kept at a distance from the parchment, by means of two transversal glass rods. In order to establish the union, a plate of copper, fixed to a strip of copper half an inch broad, is made use of; this plate, which is a little less than that of the zinc, is placed on the latter. The metallic strip dips into a trough containing mercury, as well as that which is fixed to the support of the drawing, or else the two strips are tied together. The use of mercury requires attention, for if it falls on the lower plate of copper, which it may easily do, an amalgam of copper is formed, and the plate is deteriorated. A wire cannot be employed with the same advantage, for the precipitation is perceptibly weaker. The glass vessel is filled with a concentrated solution of suphate of copper of commerce, until the square *dips*, then a little very dilute sulphuric acid is poured on the zinc. Round the plate, crystals of sulphate of copper are placed; the acid solution is also occasionally changed, and the corroded plate of zinc replaced by a new one. The small deposits of copper, which attach themselves to the parchment, may be removed; and, if they become too frequent, the sheet may be changed. We may also, instead of the *tambourine*, use a trough of half baked pipe-clay, which allows the liquids to transude, but the precipitation is then more slowly effected.

Herr Von Kobell obtained, in from four to six days, by the method we have described, plates of four inches square, and more than a line in thickness, without any remarkable inequalities. If any be found, the plate is withdrawn, dried with blotting paper, and filed very smooth.

III. PHARMACY, &c.

MEDICAL REFORM.

Another session of Parliament will leave the matter of medical reform just in the state that we anticipated. The subject is one which embraces so many objects, and such conflicting interests, that we heartily commiserate the misfortune of the individual who undertakes to legislate in so hopeless a cause. Forlorn, indeed, is the prospect of any one who engages in the arduous enterprize of reforming a profession in whose ranks is to be found every gradation, from absolute ignorance and quackery, to the most distinguished eminence of scientific attainment—a profession containing certain classes, who, like the renowned Hygeist, administer at one dose, to a single individual, as large a quantity of medicine as would serve Hahnemann and his disciples for a million.

Well, indeed, will that man deserve of society, who succeeds in placing the profession of medicine on a respectable, or even decent, footing; for, we fear, it will be long before any stop is put to the present system of fraud and humbug. Every cheat and impostor can practise his delusions, or vend his nostrums, whether he be armed with a certificate or not, and it little matters to the public (who are the sufferers), whether they are duped and deprived of health by the illiterate apothecary, or by the Jordans, the Eadys, and the Morisons: we hold the lower rank of the profession to be as injurious to both the public and the profession, for to the one it is the means of depriving them of more able relief at a cheap rate, while from the other it takes that business which is the due reward of superior education and higher attainments.

In this brief sketch we may take a review of the three divisions of medical practitioners, viz., physicians, surgeons, and apothecaries. It is quite clear that the higher ranks, viz., the physicians and surgeons, are not the instigators of enactments to change the present state of the medical profession by measures which are termed by their projectors Reform.*

The physicians, as a body, are beyond doubt most to be relied on. They are required to possess a good classical education, and a certain amount of physiological and pathological science; although we are aware that in these branches they are very far from profound, and in anatomy, generally very superficial, yet the public has in them an ample protection against palpable ignorance and risk of utter disqualification. It is nevertheless to be regretted that instead of writing prescriptions in the very worst Latin, they are not content with plain and intelligible English, and that instead of attempting to give the precise chemical name to every compound in the Pharmacopœia, they do not pay more regard to the safety of their patients, and observe more caution

* This, we think, the apothecaries would best effect, by beginning at home, and increasing their classical and professional knowledge,—in fact, by first "setting their houses in order;" and no doubt the other branches will keep pace with them.

against ignorance and inexperience in the person who may have to dispense them. This body, with the exception of its exclusive and monopolizing system, is certainly the best regulated and least meddling of all the divisions of the professions, and we should earnestly advise the sick at once to refer their cases to any distinguished physician, and get the prescriptions compounded at a respectable chemist's, as by far the most effectual and economical mode of getting relief from their diseases.

As a corporate body, the surgeons are by no means either so well educated, classically or scientifically: for, with the exception of the few who are destined for hospital or operating practitioners, the main body is composed of such as are also obliged to exercise the calling of the apothecary, midwife, and even chemist, keeping an open shop, and selling by retail. To such, an appeal is very seldom made by the more aristocratic part of the community in any important cases of surgery, and even by the lower classes, he is never called on, nor entrusted, to perform any important operations.

We contend that there ought to be a legal power by which to prevent the practice of surgery by any impostor who has the audacity and presumption to deceive the community. No person can be aware whether he is a member of the College, unless by reference to the list;* we therefore advise the members of the College to write on their doors and cards, M.R.C.S. There is no law to prevent any person, *not a member*, from exercising the art of the surgeon; he can only be proceeded against if he is guilty of mal-practice, and for this the *regular surgeon* is *equally liable* to legal proceedings. Means to protect the surgeon against this invasion of his rights certainly ought to be provided by the legislature: we do not mean by any act compelling the individual to submit to the farce of an examination at that libel on a scientific body—the Lincoln's-inn Exhibition, now, fortunately for society, on its last legs,—but by a well organized plan of education and examination in every branch connected with this part of the profession, without which no one ought to be allowed to exercise the art of surgery any more than medicine.

We now proceed to notice the situation of the apothecary, who, in relation to the other members of the profession, enjoys advantages far beyond them, save and except the grade in society. He has at command all the branches of the healing art, viz., medicine, surgery, midwifery, and the dispensing of medicines, and selling of drugs, and yet is he perpetually brawling for medical reform, and crying out against chemists for advising in cases of instantaneous urgency, and among the poor who cannot afford his charges,† and who, but for the chemists, must go without advice, or, what is worse, apply to dispensaries.‡ What security has the public in the qualification of the apothecary?

Little faith is to be placed in the examination of the students at Apothecaries' Hall: the persons entrusted with the office are too eager for gain and patients, to take any interest in acquiring the knowledge requisite to lay down an efficient mode of inquiry into the qualifications of the applicants for certificates.

Qualification, alone, we contend, ought to be made the passport to privilege, and it is this that the legislature ought to enforce with the strictest rigor, and is the best and only reform required.§

We should rejoice if we could give the apothecaries credit for the same laudable and generous spirit displayed in so liberal a manner by the chemists at the late meeting, at which they declared their wish and determination to obtain such knowledge as is necessary to ensure the public safety, their own advancement, and security against the insults and taunts of general practitioners, in whom we have never seen any thing worthy of the name of science. It is very easy to demonstrate to the satisfaction of our readers the little confidence merited by general practitioners; take for instance the art of midwifery. In almost every case where nature steps out of her ordinary

* It is our intention shortly to publish a list of all the apothecaries practising surgery in London without a diploma.

† Hapless are the poor creatures who apply to these men: they are drenched and charged, and, as we too well know, if they cannot pay them,—and what poor mechanic or laborer can?—are summoned in scores to the petty courts, and made to rue their fate: such practices we have too often seen among the low fraternity about Shoreditch and Ratcliffe Highway.

‡ In these places much reform is required. What will our readers think of medicines being given in a piece of newspaper, and the patient told *verbally, not in writing* to divide the powder into six or eight parts? Is this the way to administer medicine?

§ In Dr. Forbes's plan for remodelling the profession, upon the basis of education, we feel glad that he has advocated what we have been contending for for sixteen months. Any other method will leave the matter in a worse state than at present. We protest, however, against any reform confided to either college. These corporate bodies have too long humbugged the public and profession, and we view them with the same obliquity as we do the court of aldermen.

course, and the least difficulty presents itself, the nearest physician is sent for, and the case is entrusted to him as one requiring a consultation; whereas it is mostly such as a person, educated as he ought to be compelled to be, should possess the power to conduct alone. With such men what is the situation and risk of the patient, if some of the many casualties such as flooding, &c. occur in the course or progress of the labor? We have often been called to cases where the practitioner in large business did not even know the membranes when he saw them, and which in great part he had bunglingly left behind through want of knowledge of the proper mode of conducting the case.

We also urge, as most imperative, that every practitioner ought to have a proper classical education, as this being the business of early life, will greatly contribute to form in him habits of reading and study, and give him the deportment of a gentleman—a quality very much wanting in the medium ranks of medical men. The education of these men, with regard to literature as well as science, is grievously deficient, and has tended more to degrade them than any other causes; for we have always found the generality of them dunces in the one, and smatterers in the other, and we are convinced that without their services at all, the public would not only be uninjured, but benefited.

We now proceed to consider the part Chemists and Druggists are to take in the grand schemes of Medical Reform, and we may here remark, that they have evinced a liberality and a spirit of generous emulation far superior to their traducers and maligners. They openly avow their desire to receive a suitable education, and to undergo such an examination as will protect the public from the dangers of incompetence. What more can the apothecaries want? What more can be expected of chemists? It is stated "that thousands of children are annually destroyed by them;" an assertion which we at once denounce as a palpable falsehood, and were it even true, by far a greater number of children and adults too are annually sent to the grave by the ignorance and quackery of the "gallipots, who now, as in the days of Shakespeare, seem to have but a very low grade in the scale of scientific men.

Now is the time for exertions on the part of chemists to maintain their rights, and to increase their claim to public respect and confidence. We earnestly advise them to form themselves into a body, or societies, not the less honourable because it may not be a corporate one, nor at all approximate the Turners and Saddlers of Magog Hall. Chemists have nothing to do with civic trumpery or common council deliberations; they better suit those whose tastes and pursuits tend to traffic, not science.

We advise them in such an association to form bye laws, to enforce the study of chemistry, botany, materia medica, and pharmacy, as necessary to enable their pupils and assistants to conduct their business with better success; and in a very short time, we are satisfied, they will reap the reward of such a course, and put their enemies to flight.

MEDICAL REFORM AS AFFECTS DRUGGISTS.

To the Editors of The Chemist.

GENTLEMEN,

On the 17th,* as we are informed, the "one faculty" legislators are to make their second demonstration. The druggists will no doubt be on the alert to frustrate any attempts that may be made of a smuggling character. Their opposing attitude on the first occasion seems to have overawed even Mr. Hawes himself. But why should the druggists be put to the expense and degradation of merely opposing such proceedings? Why do they not rather manfully originate some measure of their own? The conjunction of the medico-political planets of the present crisis is most felicitous towards them. The index finger of events is actually pointing to good fortune, rather than to that annihilation which their jealous rivals seem sighing for. The druggists are not to be extinguished by Act of Parliament: that impulse which of late has been given to British intellect, in the mechanical and other practical sciences, has not so completely passed by them, as to leave them without considerable advancement. A field is also widening every day for the labors of the much-abused prescribing druggists; a new era has dawned upon them, and they are every day becoming more fitted for the duties required by the change. With the poet they may fairly say—

"Tempora mutantur, et nos mutamur ab illis."

None ought to be better aware than the Medical Journalists themselves, that the very men picked out just now as the fair game for their ridicule and abuse, are precisely the men that are destined, at no distant period, to be lifted up into an inferior, but lawfully qualified grade of *medical practitioners*. Some may dream themselves into a persuasion of strange theories respecting a "one faculty," but it is a notorious fact, *in practice*, that the science of medicine is a very divisible science, not only in kind but also

* Our correspondent's letter was received on the 15th, two days previous to the debate.

in degree. A man, for instance, capable of undertaking the cure of any matter, "from a corn up to a consumption," has a fair right to consider the "one faculty" as centred within himself; but will he contend that no man can cure a corn unless he can also hold the tight rein upon a galloping consumption? No candid person will deny that there are thousands of the smaller ailments of life (particularly among the working classes), where a high standard of intellect and education are *not* required. People do not, in the general way, incur the expense of a steam-engine to do the work of one pair of hands and in the trifling (majority of) cases of what may be called "home practice," an expensive medical education is not called for, *nor can it be afforded.*—I now come to consider the actual position of the chemists and druggists at the present time. Entrusted through a long period with the preparation of medicines for the highest grade of practitioners in this country, their duties between the patient and the physician have ever been of an important kind; not only confided in most fully by the physicians, they have also enjoyed no small consideration of friendship and respect from that eminent body. What then would be more consistent or natural, than that they should seek from *them* some public and sanctioned qualification? We are the servants of the College of Physicians, they, on the other hand, are also our friends. They have to perform the higher functions of sagacious counsel; we, the more menial ones of directing its application. To our own masters, therefore, we ought to be capable of standing or falling; but not to be the subjects of insult and interference by an order of medical men altogether distinct and separate from us.

The gentlemen of "1815," although shooting originally from the same reputable stock as ourselves, have ever shown a degree of uneasy pride and restless ambition; dissatisfied not only with their "rights and privileges," but ashamed of the very name of their calling, (if we may judge from that small latin contraction written on their cards and *shop fronts*—I mean the word "&c.," which, when done into English, signifies an apothecary!) I would propose that these gentlemen should henceforth dub themselves with some more lofty title; and if so, perhaps they will allow us to dress ourselves up in their cast-off garment; for, in fact, it has not been much worn, and was not a good fit from the first. But the junior practitioners must then give up the fine shops, the perfumed oils, and grease of the bear; the seniors should also bid a long, though painful, adieu to the

"Green earthen pots, bladders, and musty seeds—

"Remnants of packthread and old cakes of roses!"

Would science be impaired in its growth by a removal from the grease and the perfume? Would pharmacy be crippled in its resources if taken from that place called the "surgery" into the well-appointed druggists' shops? The chemists and druggists are, in fact, the only real and proper apothecaries; and as they derive the most important part of their trust from the College of Physicians, I think it would not only be consistent, but highly respectable and advantageous, if they could be made amenable to the College of Physicians by a license as *their* apothecaries, for the preparing and dispensing of medicines and drugs, and in the process of time by undergoing an examination (as light as may be compatible with their trust), for the treatment *at home* of trifling cases of disease. They might also, with some propriety, be termed "Licensed Apothecaries of the College of Physicians."

Connected with this subject, I would remark, that the college has, on a late occasion, signified its willingness to undertake a general supervision of the medicines contained in the druggists' shops. This regulation, most likely, would not meet the approbation of *some* of the druggists. But by the respectable portion—and I firmly believe the majority—it would be hailed as a regulation tending to exalt their character in the eyes of the public. At all events something of the kind must be done; and it would be better left to the gentlemen of kindly character and feelings, than to impudent and tyrannical upstarts. Heaven forbid that it should ever be a Wakleyan inquisition!

I remain, gentlemen,
Yours respectfully,
March 15th, 1841. W. G.

MEETING OF DISPENSING CHEMISTS AT BRISTOL.

The following has been forwarded to us for insertion, by Mr. HUMPAGE, Hon. Sec. to the Bristol Committee:—

At a meeting of the Chemists and Druggists of Bristol, held at Mr. Humpage's Medical Agency Office, on the 2nd March, 1841, Mr. Knight in the chair, it was—

1st, Moved by Mr. Ferris, seconded by Mr. Martin, and resolved,—

That the thanks of this meeting be given to the Committee of Druggists in London, for their spirited and successful opposition to Mr. Hawes's obnoxious bill, which threatened interference with their acknowledged and established rights.

2nd, Moved by Mr. Giles, seconded by Mr. Canning, and resolved,—

That this meeting has heard, with much pleasure, from Mr. Humpage, that a sub-committee has been formed in London, with powers to adopt measures which may be considered necessary to maintain their rights and privileges as chemists; whilst at the same time this meeting is anxious to aid any bill tending to free the trade from existing abuses, and by a regular qualification and examination to render it respectable in the highest degree.

3rd, Moved by Mr. Black, seconded by Mr. Aldridge, and resolved,—

That a subscription be immediately entered into, and that a portion of the amount be remitted to R. Pigeon, Esq., as Treasurer of the London Committee, for general purposes.

4th, Moved by Mr. Ferris, seconded by Mr. Butler, and resolved,—

That a committee be formed of all subscribers, and that Mr. H. Knight be requested to act as chairman, Mr. Humpage as honorary secretary, and Mr. Canning as Treasurer.

5th, Moved by Mr. Clift, seconded by Mr. Giles, and resolved,—

That the best thanks of the meeting be given to the chairman for the efficient performance of his duties, and that he be requested to forward a copy of the resolutions to the Central Committee.

(Signed) HENRY KNIGHT, Chairman.

REFUTATION OF THE HOMŒOPATHIC DOCTRINE OF HAHNEMANN.

BY M. P. H. HARPER.

Had it not been that homœopathy arose when the doctrines of Brownism were at their height, and when people began to get tired of the absurd doctrines therein developed, it never would have been known beyond the sphere of Hahnemann's own circle. The absurd doctrines which it sets forth would never have found place, except among persons incapable of thinking for themselves; and though, no doubt, like every other wild scheme, it has in the end been productive of some good, in calling the attention of physicians to the unnecessary and absurd length, and useless and unchemical combination of their prescriptions, and to the largeness of their doses, yet it would never have "spread like cholera" throughout Europe, nay, almost the world.

All that Hahnemann ever said or published amounts only to assertions; he has rejected all that was before received, without giving us any thing in its place, except a list of the effects of remedies upon the healthy subject; and on this the homœopathic physician is to found his rules for treating any given case. Of the pathology he has given us only a few fragments, and of a system of therapeutics, nothing.

Diagnosis likewise remains unnoticed; indeed he entirely rejects all division of diseases, and, consequently, their division under generic terms, the doctrine of crisis, &c.

They regard only the particular pains and debilities of which the varieties of sickness are composed. The proximate causes are likewise overlooked, though the remote causes are more studied, at least in relation to diet. Homœopathy is thus in direct opposition to the Hippocratic system, which has existed for twenty-two centuries.

We will now proceed to the more immediate object of this article, viz. an examination of the papers of Mr. Young, which lately appeared in the "Chemist." The first thing requiring notice is, "Hahnemann argues that all diseases proceed from derangement of the dynamic power or vital force, and that the cause (that is, the mode in which external objects, exposure, &c., act upon the vital energy) must for ever remain hid to the human intellect." Good! No physician pretends to say that he can always find out the proximate causes of all diseases, but to refer them all to dynamic power, is contrary to reason. Because all, or most diseases, are attended with more or less derangement in the circulation. I suppose Hahnemann would always lay the cause there. Let us allow, for an instant, that it is so; it is well known that in many cases of derangement of the intestinal tube and stomach generally, there is great shortness of breathing, cough, and other signs of derangement of the organs of circulation, or of the dynamic power, and that all these symptoms are easily removed by an active aperient. Now would an Homœopathist pretend to say that the derangement of the dynamic power first produced the derangement of the intestinal tube, when all the symptoms of its derangement are altogether secondary, and immediately relieved by removing the cause, viz., the derangement of the intestinal tube? Would he say that a violent attack of colic, or of gall-stones, or of calculus in the bladder, proceeds from derangement of the dynamic power? What becomes of the well known sympathy existing between distant organs? Are the actions and powers of the nervous system of no use? I say then, it is impossible for all diseases to proceed from derangement of the dynamic power.

The next thing requiring notice is, the general observation, proofs, &c., in support of their favourite motto and foundation stone, "similia similibus curantur"—a doctrine equally untenable with the last. Homœopathy assumes that the different articles of

the materia medica, when administered to healthy persons, induce disease, and that the disease occurring naturally, can be cured only by the aid of medicine capable of exciting those symptoms most nearly resembling those of the disease, but which occur with greater intensity. Sulphate of quinine, they say, is capable of producing symptoms closely resembling those of ague, for which it is a specific—mercury is capable of producing both local and constitutional symptoms closely resembling syphilis, and so on. We will just suppose a case or two. A strong healthy man is attacked with violent pain in the bowels, excessive tenderness on pressure, violent vomiting, &c., and accompanied with a strong full bounding pulse. Now all these symptoms are speedily relieved by bleeding two or three times, to twenty or thirty ounces, and strong antiphlogistic treatment altogether. How would an homœopathist have treated such a case? By giving perhaps the sixtillionth of a grain of arsenic, that being the drug which produces symptoms nearest resembling those of enteritis or peritonitis? Or again, a man is in the lowest stage of typhus fever, with coma, delirium, excessively rapid and feeble pulse, the tongue brown, and the teeth covered with black sordes, &c., all requiring the free use of wine, brandy, ammonia, and other strong stimulants to give him the slightest chance. How would an Homœopathist treat him? Give him perhaps the billionth of a grain of opium, and nothing else!!

Why does it not act as it ought to do, if there were any truth in it, with as much certainty in apoplexy or pneumonia, as it does in the safe ground the Homœopathists occupy, of the chronic diseases of the nervous system, in hysteria, and in all the varied forms and hydra-headed kinds of dyspepsia, in which the merest tyro knows that oftentimes imagination acts with far more power than the most potent drugs?

With respect to the cases quoted from the *Lancet* in support of this motto, I can only say, that from the beginning of last January to the end of September, we constantly had cases presenting themselves, sometimes to the amount of eighteen or twenty a week, in which the following symptoms were present. Profuse salivation coming on gradually, sometimes to the amount of several pints a day, with sore and ulcerated mouth, tongue and gums, fetid breath and signs of disordered circulation. In not a single instance could we trace a single particle of mercury having been given in any way. They were all speedily relieved by attention to the secretions and alum gargles.

The next thing requiring notice is the amount of doses given by Homœopathists. They altogether banish from their list of remedies, bleeding, blistering and purging—remedies which have always been looked upon as the main props in the cure of disease. The ten millionth of a drop or grain, say they, produces a power and energy, so perfectly in the inverse ratio of the quantity, that many of the chronic cases of disease require the dose to be augmented a thousand fold lest the tremendous energy of the minute dose should overcome the patient instead of the disease, and produce death to the victim or the doctrine by the overwhelming smallness of the dose. Indeed I think that the infinitesimal doses of their medicines might almost confound the mathematical acuteness of an Euler or a Laplace.

I will endeavour to shew by means of figures the absolute absurdity of these, and shall take two of their remedies, viz., mercury and capsicum for that purpose. Hahnemann says, that the dose of the first is the sixtillionth of a grain: now it appears very easy to talk about the sixtillionth; but when it comes to figures, an unit with a train of thirty ciphers is rather a formidable thing. The population of the world is computed at 800,000,000, and supposing every person to swallow an homœopathic dose once a second, it would require upwards of 27,000,000 of years for them to get through the thousandth part of a grain.

For the following calculation with respect to capsicum I am indebted to a paper by Mr. Smith, in the *Medical Gazette*:—

"The area of the great pyramid of Egypt is 480,250 square feet, and its height 500 feet, its solid contents are 80,041,666 cubic feet. Say we have 378.875 minims of spirits of wine in a cubic foot, divide the trillion by this number, and the result is, that we have 2½ billions of cubic feet in a trillion of minims; extract the cube foot, the result is 13,758 in feet, which will be the length of each side of a cubical vessel which will hold a trillion of drops of spirits of wine, viz., it must be above two miles and a half in length, and the same in width, and likewise in height, or, comparing it with the great pyramid, it would require above 32,600 pyramids to contain the spirits of wine to dilute one grain of capsicum."

This all sounds mighty well, indeed, but it is no joke? Can any person with only that amount of common sense about them, recommend such doses for the use of disease? I should think not. Again, how is it that the doses which we are constantly taking in the ordinary necessaries of life do not act in the same way? Water contains sulphate of soda with the other in minute proportion. Now, bread is made up of a small proportion of water, consequently the doses of the salts approach nearer to the homœopathic doses: how then is it that they do not act?

Other instances of the same sort must oc-

cur to every body in an instant, so that there is no need of repeating them here. But Homœopathists account for the extraordinary action of their doses in two ways—first, by development of electricty, and, secondly, by acting on the exact part diseased. With respect to the first, supposing that electricity is developed during the trituration, how is it retained in the molecules of the medicines, when, as is well known, electricity, however developed, has an overwhelming tendency to discharge itself through the surrounding objects, so as constantly to preserve an equilibrium. How then can it be? As to the other reason, perhaps they will be good enough to show us the exact seat of the disease in fever, hydrophobia, chorea, or tetanus; by so doing, I am sure they will confer a lasting benefit on both patient and physicians.

But the Homœopathists may say—Well, we succeed in curing our patients: how is that, if our doctrine be so absurd? Granted, but how do they succeed? First, by inspiring great confidence in their remedy. I think, if memory fail me not, I have seen in an old number of the *Lancet*, the case of a lady who, having consulted an Homœopathic doctor, who gave her a box of globules, which, on going home, she placed on the mantle-piece, where were also some fulminating balls in the same sort of box, and by mistake she swallowed all the latter, and got well, though the Homœopathic remedy was untouched. Here, then, was the effect of confidence in the remedy. Secondly, by being excessively strict with respect to diet; with respect to which physicians generally are sadly lax, though there is no disease which is not benefited by strict attention to it. Thirdly, the greatest thing in medicine is to know when to do nothing. A well directed pause in the treatment often hastens, and almost completes, a cure; and though the patient may not like such a manœuvre, yet it is by pausing at the right time, but still pretending to do a great deal, that Homœopathists sometimes succeed, in cases which, if left to themselves, would soon be well.

I think, then, that we may conclude this doctrine to be at variance with every rule of inductive philosophy, and of the causation of disease. A doctrine setting forth that the effect is greater as the cause applied is less, and leaving no explanation of a case where a cure is effected, otherwise than by regulating diet, and the natural restorative powers of the living system, with the imagination of a confiding, but deluded, patient; and a doctrine full of absurd and untenable dogmas.

I think that eventually people's eyes will be opened to its absurdity, though it undoubtedly has had, and yet will have, numerous proselytes; and it is only that chemists may have an opportunity of judging both sides of the question that I have been induced to write the above.

ERRORS IN DR. THOMSON'S CONSPECTUS.

To the Editors of The Chemist.

Gentlemen,—Having read the attacks on the Conspectus which have appeared in your work, permit me to offer a few remarks on the last of them, which appeared in your March number. In doing so, it is not my intention to defend any errors which may be detected in the Conspectus; on the contrary, I lament that any should be found in it; but when it is recollected, that the object of that little book is merely to supply an aid to the memory of the prescribing practitioner, not to be a guide for the pharmaceutical preparation of drugs, the danger to life, which your correspondent, who may be justly regarded a microscopic critic, has declared to depend on the errors he has pointed out, will be acknowledged to be neither so great nor so threatening as he has stated.

The errors crept into the edition before the last, which appeared at a time when I was labouring under very bad health, and was obliged to travel on the continent on that account. The correction of the press was left to a friend, who was less familiar with the inspection of proofs than I supposed him to be. As soon as I was made aware of the errors, those that were pointed out were corrected in the subsequent edition of the works, which appeared in the commencement of 1840; but it had passed through the press, before the new edition of the Edinburgh Pharmacopœia came to my hands. It is not likely, therefore, that your correspondent will find any of the new formulæ, or the corrections of those that have been altered, or the change of names contained in the present edition of the Edinburgh work. I have completed the materials for a new edition of the Conspectus, into which the alterations of the Edinburgh College are interwoven: and as I shall be able to superintend the press myself, I shall feel greatly mortified if even your microscopic-eyed critic shall light upon a single error.

Fair play is a right which every author merits, and in asserting my claim to it, I may state, that your critic will find that the following errors which he has set down do not exist in the Conspectus of 1840.

In p. 5, in the formula for Hydrocyanic acid, Ojss of water is ordered, not Ofs as mentioned by the critic.

P. 30, Ceratum Hydrargyri comp. is *not* omitted.

— 39, Decoctum Amyli *will* be found.

— 56, Ferri-Ammonio-Chloridum is *not* called Ferri-Potassio-Chloridum.

— 132, Tinct. Balsami Tolutani *is* mentioned.

— 134, Tinct. Colchici comp. *is* noticed.

— 136, Proof spirit, *not* rectified, is ordered by the College for tincture of opium.

I think the worthy critic also has gone too far, in stating that I have ("*oftener!*") retained the old names, than adopted the new, and confounded the names of the different colleges. His accusation that I have left out some of the officinal preparations, I can readily bear; for as the work is a mere memorandum-book, as already stated, for prescribing, the mode of preparing the articles, in many instances, affords no information of use to the prescriber.

To show how easy it is to make mistakes, this critic, in reference to Liquor Potassæ, has mentioned gr. x and gr. xv, instead of ℥ x and ℥ xv; and this in noticing only twenty-four articles; yet, he regards it wonderful, that errors should have crept into a list containing upwards of a thousand.

Most of the errors which he has pointed out are of little consequence in a practical point of view. I do not mean, by this remark, to defend them, for whatever may be the intention of introducing the quantities in the formulæ, I admit that, when introduced, they ought to be correct.

Nothing, Gentlemen, is so easy as to find out the faults of any work—to pick holes in the doublet of any author: let your correspondent try the task of compilation, where the matter is of the varied character contained in the Conspectus, and he will be ready to join in the supplication of Pope's admirable universal prayer—

"That mercy I to others show,
That mercy show to me!"

I remain, gentlemen, yours respectfully,
A. T. Thomson.

[We are glad to find that Dr. Thomson is about to publish a new edition of his Conspectus, and that it will be free from the errors which the "Critic" has pointed out. It would be a pity that the usefulness of such a work, in which accuracy is indispensable, should be in any way diminished, by incorrectness even in trifles. There is, perhaps, no writer whose works are of such utility to the junior practitioner and dispenser as those of Dr. Thomson. We regret, therefore, that any inaccuracy should be found in one of them. The next edition will, we feel confident, be correct in every particular.]

ADULTERATION OF BALSAM OF COPAIBA.

To the Editor of The Chemist.

Gentlemen,

As the adulteration of Balsam of Copaiba is practised to a considerable extent, by both wholesale and retail dealers, may I beg you to give publicity to the following test, which will at once determine the genuineness of the article:—

Agitate one part of the suspected Balsam with two parts of liquor ammoniæ; let them remain a few hours; if the mixture continues milky, the Balsam contains castor oil.

I remain, Gentlemen,
Respectfully yours,
George Tyrer.

Liverpool, March 16, 1841.

JAMES'S POWDER AS A CURE FOR THE DISTEMPER IN DOGS.

To the Editors of The Chemist.

Gentlemen,

It may be satisfactory to such of your readers as have favourite dogs, to learn that the distemper may be cured by means of James's Powder.

I have recently had a Newfoundland dog attacked with this distressing disease, and being most anxious to save him, I employed a skilful veterinary surgeon to attend him. He usually came with his son, who has the reputation of being very clever in dog diseases. After the few first visits, a third person came with them, and held a consultation on the dog's case. These visits were daily repeated. Notwithstanding, the poor dog daily became worse and worse, till the fourteenth day, when, an unfavorable change having taken place during the night, they pronounced his case to be hopeless; adding, that it would be cruel any longer to torture the poor brute with drenches.

The treatment was as follows:—

A warm bath daily, at the temperature of 93°; and thrice a day a ball composed of tartrate of antimony and extract of aloes. This was, however, preceded by taking 4 ounces of blood from the animal.

The case having been at length pronounced hopeless, I sought advice among my neighbours; from one of whom I learned that James's powder would effect a cure, although this was, as I have before stated, the fourteenth day of the attack; and the surgeons declared that, agreeably to their experience, he must die on the seventeenth day.

Following the second advice, I administered 4 grains of James's powder night and morning; and, as occasion required, one tablespoonful of syrup of buckthorn.

On the sixteenth day, the nose, which had been previously stuffed up with mucus, began to discharge; and the breath, which had been very cold, was increased in temperature. We looked forward to the seventeenth day with considerable apprehension; but, on that day, the dog was evidently bet-

ter; his appetite had improved, and I still, as heretofore, continued to feed him upon bread sopped in warm milk and water. On that day, also, his eyes almost recovered their natural clearness; and on the nineteenth day, they presented an unnatural dilatation of the pupils. Whereupon I discontinued the James's powder, which I never afterwards had any occasion to repeat.

Day after day passed, and the dog improved in health and strength; and on the twenty-first day, he was able to walk across the stable, though, in doing so, he tottered and fell from excessive weakness. He slept well and had a good appetite; and on the thirtieth day, I gave him a mess of stewed flesh, which I repeated once a day till his appetite was so voracious that, on one occasion, he devoured four pounds of meat. By degrees this desire of food abated, and at the end of six weeks, the dog was able to be exercised out of doors, and he had acquired strength sufficient to gallop. He was now suffered to go at large in the day time, but was shut up whenever the weather was rainy, and always at night.

Five months have now elapsed since the dog was given over by his first medical attendants; and he is now in the enjoyment of robust health, saving only a slight spasmodic catching of the muscles about the loins, which, however, does not appear to give him any uneasiness, and is only apparent when he sleeps.

If you think that this case would be suitable to your excellent periodical, and would be useful, I trust you will give it a place.

I am, Gentlemen,
Your obedient Servant,
A Subscriber.

N.B.—If it were insisted that on the 17th day a crisis was to be expected, and that it must prove either fatal or otherwise to the dog, I may answer that the amendment took place within six hours after the first dose of James's powder was administered; and this I consider conclusive, seeing that that first dose was given to him on the 14th day.

BLISTERING TISSUE.

To the Editors of The Chemist.

Gentlemen,

A very great improvement is being effected in the mode of vesicating, which, when generally known, will, in a great measure, supersede the old method of blistering. Tissue paper is now smeared over with an adhesive solution of cantharidine, and this is applied to the skin, and bound down tightly, so as to keep it in a proper position.

I am not aware that chemists generally prepare the tela vesicatoria, as it is termed, but I think that the profession should endeavour to introduce it, not as an exclusive preparation, but (as it is likely to be used in preference to the emplastrum lyttæ) as a general and easy method, for the dispenser, and also for the patient.

I wish to call attention to this subject through the medium of your excellent and widely circulated journal, and trust that some of your intelligent readers will devote a little time to the investigation of it, and produce a varnish, capable, when spread upon tissue paper, of adhering to the skin, and producing a blister in eight or ten hours from the time of application.

In prosecution of this subject, under the impression that rectified ether would extract the active principle of the fly, I prepared a strong solution, and after macerating with a gentle heat, for a few days, filtered, and obtained a dark greenish coloured liquid. I carefully evaporated this until reduced to a syrupy consistence. when I applied a portion of it to tissue paper, with a camel hair pencil. It was quickly absorbed, and from the evaporation of the ether, it very soon dried. I cut a piece of this paper, which I laid upon adhesive plaster, leaving a good broad margin, and this I put upon my chest on going to bed. I experienced no disturbance or uneasiness during the night, and upon examination in the morning, slight redness only had been produced.

At present I am considerably occupied with business, but when I have a spare hour, I purpose to devote it to researches on this subject, and as a hint to others (who I have no doubt will also make the attempt to produce the paper), I think, that to obtain the cantharidine nearly pure, and combine it with a simple varnish, will be the most ready and convenient way of reaching the desired point.

I may have occasion again to communicate on this subject: in the meantime,

I remain, Your most obedient servant,
A Retail Chemist.

P.S. Smith, of Edinburgh, at present, is the only maker of it, and his price is most exorbitant for the paper prepared so as to blister.

NITRATE OF MERCURY OINTMENT.

To the Editors of The Chemist.

Gentlemen,

In the last number of the "Chemist," you give a letter from a correspondent, describing a method of making the nitrate of mercury ointment of a beautiful color, and of good consistence, by mixing the solution of mercury with pure olive oil.

There is some mistake here; if pure olive oil be mixed with acid nitrate of mercury, the mixture becomes hard in a few hours, and, indeed, Dr. Paris, in his Pharmalocogia,

gives this as a test, by means of which to ascertain the purity of olive oil, and tells us that, if it be adulterated, it will not undergo such a change.

Hoping that your correspondent will be so obliging as to inform us more accurately how he makes the ointment, of the color, and consistence he names,

I remain, Gentlemen, respectfully yours,
GULIELMUS.

Newcastle, March 6, 1841.

SECALE CORNUTUM.

An Essay on the Chemical, Botanical, Physical, and Parturient Properties of the Secale Cornutum. With an Engraving. By T. H. WARDLEWORTH, SURGEON. London: Simpkin, Marshall and Co.; Bancks and Co., Manchester; and Wrigley, Rochdale. 1840.

THE Secale Cornutum, or, as it is more commonly called, the Ergot of Rye, is very ably treated of in the little work before us.

Mr. Wardleworth has long been known as a respectable surgeon, and he has given in this essay abundant proofs of extensive opportunities of observation.

He treats the subject very fairly, giving the arguments used against the employment of this medicine as well as those in its favor.

The author illustrates his work with numerous cases in his own practice, in which the Ergot was found successful.

We may conclude this short notice by recommending the book to the profession, and our readers generally.

The Touchstone of Medical Reform, in three Letters, addressed to Sir Robert Harry Inglis, Bart., M.P. By JOSEPH HENRY GREEN, F.R.S. Professor of Anatomy to the Royal Academy; one of the surgeons of St. Thomas's Hospital, &c. —London: Highley, Fleet-street, 1841.

We have read with attention Mr. Joseph Henry Green's pamphlet entitled the Touchstone of Medical Reform; and though there is in it much in which we agree, there is still more from which we differ, and we are confident that the general plan is one which will not soon be acted upon. We have long come to the definitive conclusion, that entire reform in the method of education and examinations totally free from the trammels and tyranny of existing institutions will alone secure the respectability and independence of the profession.

TO CORRESPONDENTS.

MR. HAVILAND.—We wrote to the publishers of Dr. Turner's work, on the subject of our correspondent's note; the following is the answer returned to us. We insert it as being the best answer to this and other correspondents:—

"Upper Gower-street, March 12, 1841.

Sir,—The delay which has taken place in the publication of the Supplement to Dr. Turner's Chemistry, has arisen from a desire on the part of the editors to give the subject in the most complete form. The manuscript in German is now finished, and the greater part of it translated. The printing of the Supplement has commenced, and we hope the Part will be ready for publication in about a month or six weeks from the present time. We are, Sir, your obedient Servant,

TAYLOR AND WALTON."

"X. Y. Z."—Yes: Dr. Turner's Elements, 7th edition, 21*s.*, or Brande's Manual of Chemistry, 30*s.*

Will Mr. T. SMITH state more explicitly what he wants?

Mr. T. M. RELPH.—Hot Naphtha. Apply to our publisher.

"T. R. F. C."—Spongy platinum may be prepared by adding a saturated solution of muriate of ammonia to a solution of bichloride of platinum. The platino-bichloride of hydrochlorate of ammonia is precipitated of a yellow color. This salt is to be heated to redness, when the platinum is left in a spongy state.

We wrote to Mr. KERNOT.

"A SUBSCRIBER."—We may recommend Professor Donovan's Treatise, 6*s.*; or GRIFFITH'S Recreations in Chemistry, 4*s.* 6*d.*

The conclusion of M. ORFILA'S experiments on poisoning by arsenic is unavoidably postponed until our next.

"AMICUS."—Decidedly PEREIRA'S.

Letters received from Mr. SWAN, Alnwick, and "A. J.," Durham.

"Alfred Watts," "Late Hours," and "B. B." in our next.

Two Numbers of Edinb. Month. Journ. received.

Nos. I. III. and IV. of THE CHEMIST *being out of print, the Publisher will be happy to repurchase them at the full price, or take them in exchange for any of the other numbers.*

NOTA BENE.—*All Communications and Books for Review must be addressed, "To the Editors of The Chemist, care of Mr Hastings, Publisher, 13, Carey-street, Lincoln's Inn Fields, London." Communications must be pre-paid, and sent before the 15th of each month; Books for Review, before the 10th.*

ERRATA.

No. XIV., page 55, col. 1, line 26 from bottom, by a mistake of the press, "concluded" was put for "continued."

No. XV., page 16, col. 1, line 22 from top, for "ingratitude," read "turpitude."

LONDON: PRINTED BY STEWART AND MURRAY, OLD BAILEY.

THE CHEMIST.

I. CHEMISTRY.

ON THE COMPOSITION OF THE AIR WHICH IS FOUND IN THE PORES OF SNOW.*

BY M. BOUSSINGAULT.

Saussure, during his stay in the defile of the Géant, having examined the air confined in the pores of the snow, thought that it contained considerably less oxygen than atmospheric air. The following, is the manner in which he expresses himself,

"We thought, but rather late, to collect the air which is found contained in the interstices of the snow, and we took it to M. Sennebier in order to analyse it. At Geneva, a mixture of equal parts of atmospheric air and nitrous gas, gave him, twice running, 1·01. The air of the snow tried in the same manner, gave him at one time, 1·85, and at another 1·86. This trial, which would appear to indicate such great impurity on the part of this air, would have required experiments to ascertain the nature of the gas which occupied the place of the oxygen."†

At the time of Saussure's works, eudiometry had made but little progress; however, be its state of imperfection what it might, it would be difficult to admit that such observers as Saussure and Sennebier could be deceived as to the direction of the difference which they had found in the composition of two gases analysed by the same means and in the same conditions. It was this reflection that led me to repeat Saussure's experiment when I was among the glaciers of America.

In a first attempt made by Colonel Hall and myself to mount the Chimboraço, towards the declivity that overlooks Chillapulla, we encountered such moveable and deep snows, that, despite all our efforts, it was impossible to get higher than 5115 metres. It was at this station that I filled a flask, hermetically closing it, with snow. When we arrived at the cabin in which we had to pass the night, the snow was completely melted, the water arising from this melting occupied about $\frac{7}{8}$ of the capacity of the vessel.

Having analysed the air found in the flask, by means of phosphorus, I ascertained that it contained from 16 to 17 per cent. of oxygen.

The former experiment of Saussure, which I called to mind by verifying it on the perpetual snows of the Andes, attracted the attention of philosophers. A German observer, M. Bischoff, in a series of investigations relative to the physics of the globe, which he undertook during an excursion to the Alps, had an opportunity of verifying it anew. He triturated hardened snow under water; the air which he procured by this means, analysed by the eudiometer with sulphuret of potassium, gave only from 10 to 11 per cent. of oxygen.

Until now, these investigations were made in the high regions, on the glaciers. It was desirable, in order to complete them, to examine the air from snow collected nearer to the level of the sea. It was with this view that I made my observations on the snow which fell in Paris at the end of December 1840 and at the beginning of January 1841. On the 20th of December, I heaped up some recently fallen snow in an eprouvette which I placed over a mercury bath.

The compressed snow occupied a volume of 287 c.c.

After fusion, the volume of air disengaged was 109 cub. cent. at the temperature of 4°·5, and under the pressure of 0m.743.

Let it be 104c.c.' 8 at 0° and pressure 0m·76.

The volume of water was 200 c.c.

The air examined on the 23rd of December, yielded by phosphorus, in the first analysis, 18·6 per cent. of oxygen; in the second, 18·8.

* *Comptes Rendus*, No. 7; 15 Fev., 1841.
† *Saussure*, tom. vii. p. 472.

On the 6th of January, a capsule of the capacity of 127 c.c. was filled with compressed snow. After fusion was obtained:—43 c. c. of air at the temperature of 1°, and under the pressure of 0m.735.

Let it be at 0° and pressure 0m.76, 41 c.c.A.

One volume of water of 80 c.c.

The air, analysed shortly after the fusion of the snow, contained 19 per cent. of oxygen.

Thus, the air which is disengaged during the fusion of the snow, contains, in Paris, as on the Alps, and as on the Andes, considerably less oxygen than atmospheric air. May it, notwithstanding, be concluded that such is the composition of the air confined in the pores of the snow before its fusion? No, without doubt: and on this occasion I will quote the opinion which I gave in the narrative of my ascension to Chimboraço, in relating the fact which confirmed Saussure's observation.

"The eudiometric result which I have obtained is certainly free from all objection; but I think that new experiments are required in order to clearly prove that the air which I examined was indeed exactly that which existed in the pores of the snow before its fusion. Indeed, to procure this air, it is necessary to wait until the snow is melted; the gas of the flask is found in contact with the little or not at all aërated water resulting from that fusion. Now, we know that, under similar circumstances, oxygen dissolves in water more readily than nitrogen, and that the air with which the water is saturated, is richer in oxygen than that of the atmosphere. The air which remained in the flask, might therefore be less rich in oxygen, although, in reality, the whole of the air contained in the snow might have the ordinary composition."*

This is the true explanation of the small proportion of oxygen found in the air procured by melting snow; it will be demonstrated by the experiments which I have described, when I have completed them by the following observations:—

On the 20th of December and the 6th of January, independently of the experiments which I have detailed, I had arranged other similar ones on a larger scale, in order that I might procure sufficient snow-water to extract the air from it and analyse it. I will mention only one of these experiments.

From 350 c.c. of melted snow, was extracted by sustained boiling, 12 c.c. of air at the temperature of 3°·2, pressure 0 m. 751. Let it be 11 c.c. 62, at 0° and 0 m. 76 pressure.

This air, analysed by phosphorus, contained 32 per cent. of oxygen, a result which perfectly agrees with those of MM. Humboldt and Gay-Lussac: they found, indeed, that the air withdrawn from:—

	per cent.
The distilled aërated water contains oxygen . . .	32·9
The water of the Seine . .	31·9
Rain-water . . .	31·0

Going back now to the preceding experiments, and taking account of the air contained in the volumes of water obtained, it was found that, although air disengaged from snow contained only from 18·7 to 19 of oxygen, the whole of this air, that is to say, air measured and air dissolved, the volume of which had been neglected, contained very nearly 20 per cent. of oxygen, or nearly the same as the atmosphere.

There is besides a much more direct means of ascertaining the real composition of the air from snow. This consists in filling a matrass with snow, and in conducting the operation as in extracting air from a liquid. The following, for example, is an experiment made on the 6th of January:—

350 c. c. of snow yielded 115 c. c. of air at the temperature of 3°·3 C. and under the pressure of 0m.746.

Analysed by phosphorus, this air gave per cent.,

In a first experiment . .	20·3
In a second . . .	21·0

It is nearly the quantity of oxygen found in the air on the same day, and by the same means.

There was, in my opinion, a certain degree of importance attached to proving the real composition of the air contained in the interstices of snow, for the fact which would establish a smaller quantity of oxygen in it might have been, from the following considerations, entirely in support of Dalton's hypothesis, which asserts that in the atmosphere, the proportion of oxygen diminishes with the height. If, indeed, snow be considered as a heap of small crystals of ice which are formed in the higher regions, we should be obliged, in presence of the air which it contains, to conclude that when water dissolved in the atmosphere is condensed into snow, it does not expel that great portion of air which it always disengages on the surface of the earth: "If it were not permitted to suspect,"—say MM. Humboldt and Gay-Lussac,—"that snow retains, confined in its very small crystals, a certain quantity of water."†

Air adheres to snow in a very remarkable manner, which shows that it penetrates to

* Memoire sur L'Eudiometrie, *Journal de Physique*, 1805.

† Memoire sur L'Eudiométrie, *Journal de Physique*, 1805.

the very smallest crystals of ice. Very little gas is obtained by passing snow under a bell glass full of water at 1 or 2° C. of temperature. Air is disengaged in any quantity only when the snow is melted. This intimate penetration of the small crystals which constitute snow, scarcely allows it to be doubted that the air which is procured from it, comes for the most part from the regions of the atmosphere where this meteor is formed. According to my analyses above detailed, we are not warranted in believing that this air has a different composition from that of the inferior regions; at least, the difference, as much as exists, is certainly one of those variations that may arise from errors of observation; however, considered with respect to its origin, the air contained in the interstices of snow presents sufficient interest for its analysis to be resumed, when the processes of meteorological chemistry are sufficiently perfect. But hitherto, and by aid of our eudiometrical methods, it must be acknowledged that the results of the experiment do not confirm Dalton's views. Thus, in his memorable ascension, M. Gay-Lussac having taken some air at an altitude of 6636 metres, did not find in it a different proportion of oxygen from that contained in the air of Paris, with which it was analysed comparatively. In the work which this celebrated philosopher made with the assistance of M. Humboldt, he carried the air of Paris to 0·21, and this number scarcely differs from that of the analyses of M. Brunner on the Faulhorn, at a height of 2600 metres, and by a process which certainly offers advantages over the former methods; M. Brunner found 20·915 air in this station.

In order to complete, as far as possible, the results obtained as to the composition of the atmosphere at different heights, I will detail the results of the analyses, which I made during my stay in the mountains of the Andes.

At Santa-Fé de Bogotà, at the altitude of 2643 metres, during the month of April, 1825, the oxygen of the air, by Volta's eudiometer, was 20·65.

At Ibagué, at the foot of the chain of Quindiù, at 1323 metres, in December, 1826, I obtained 20·7.

At Mariquita, in the valley of the Rio-Grande de la Magdalena, at an elevation of 548 metres, a series of analyses by means of spongy platinum, made in November, 1826, indicated 20·77 for the oxygen of the air.

M. Dumas announced that he and M. Boussingault are occupied with a new analysis of the air, in which, instead of substituting the comparison of volumes for that of weights, they would be able to answer to a thousandth of the true proportion of oxygen which it contains.

ACTION OF AMMONIACAL GAS ON BURNING COALS.—FORMATION OF HYDROCYANATE OF AMMONIA, AND DISENGAGEMENT OF HYDROGEN GAS.*

BY M. LANGLOIS.

In most chemical works it is asserted that gaseous ammonia, when passed over incandescent coals, produces hydrocyanic acid. M. Thenard says, according to Clouet, that nitrogen and carburetted hydrogen gases are disengaged, and that a substance, with the smell of bitter almonds, soluble in water, is formed, which has been regarded as prussic acid. Liebig attributes this discovery to Scheele. The memoirs of that illustrious chemist do not point out this reaction: we read in them that hydrochlorate of ammonia added to a mixture of coals and potassa, and heated to redness, gave cyanuret of potassium.

Although the idea of putting ammoniacal gas in contact with coal at an elevated temperature, is more than half a century old, the experiment has never been repeated. The formation of hydrocyanic acid, under these circumstances, appeared to me an interesting fact, and worthy of being verified.

I put some calcined coals in a porcelain tube passing through a reverberatory furnace, and made one extremity of the tube communicate with an apparatus in which the ammoniacal gas was produced and dried by passing over pieces of quick lime: I adapted to the other extremity an U tube receiver, surrounded with a mixture of ice and salt, and bent in such a manner as to carry the gas under bell-glasses full of water or mercury. The apparatus being thus arranged, and the joints perfectly luted, the porcelain tube was heated to redness. The heat of this tube being thus raised, I passed into its interior, for about an hour, dry ammoniacal gas. During the whole of the operation, an inflammable gas was disengaged, which was collected over water more easily than over mercury. When the experiment was carefully conducted, the gas which escaped was accompanied with but a small quantity of ammonia; it carried away only a little of the product which ought to have been condensed in the receiver. The latter contained a great many small prismatic crystals, whose form by no means resembled that of crystallised hydrocyanic

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* *Comptes Rendus de L'Académie des Sciences:* No. 5, 1 Fev., 1841.

acid. To collect them, I was obliged to cut the U tube in several places: I detached them with a glass rod, and immediately put them into a flask which I sealed with emery. There was at least 15 grammes weight of them. The experiment can be completely successful only when the ammoniacal gas is very dry, and the coal well calcined. A slight examination proved to me that this substance was not hydrocyanic acid, but hydrocyanate of ammonia. It forms a blue precipitate in the solutions of the salts of iron; the solution of potassa disengages ammonia: dilute sulphuric acid liberates hydrocyanic acid. It is very volatile, turns black in a few days, and the quicker in proportion as the temperature is higher. Confined in a flask kept in ice, it is preserved for some time without alteration. Its stability seems to be greater than that of the hydrocyanate of ammonia obtained by the ordinary processes.

The cause of the production of hydrocyanate of ammonia, by means of coals and ammoniacal gas, can be known only by analysing the gas disengaged during its formation. This gas, obtained over water, is inodorous: it is inflammable; the product of its combustion does not cause any precipitate in lime water. Burnt in chlorine, it gives rise to white sour vapors, without any carbonaceous deposit. In these re-actions, the presence of hydrogen was already recognised, but this gas might contain nitrogen and a little carburetted hydrogen. The only experiment to be made, therefore, consisted in burning this gas in the eudiometer by means of oxygen. I operated over mercury with all the care that such an experiment requires.

I measured in a graduated tube 50 parts of this gas and an equal quantity of pure oxygen. I drove this mixture into the eudiometer, which I closed before sending into it the electric spark. The gaseous residue, again measured, represented 25 parts, or a quarter of the mixture employed: a solution of potassa did not diminish its volume. In order to ascertain that the gaseous residue did not contain nitrogen, I re-produced it by repeating the experiment. I afterwards passed it into the eudiometer with double its volume of hydrogen, and I inflamed the mixture. When the instrument was opened, the mercury rose in it and entirely filled it. Considering this experiment as very important, I repeated it several times, and always with the same success. It proves that the gas which was disengaged at the same time that the hydrocyanate of potassa was formed was pure hydrogen. It is, therefore, an error to believe, with Clouet, that this gas is a mixture of nitrogen and carburetted hydrogen.

Now that we know the nature of the products which are formed when gaseous ammonia is put in contact with burning coals, is it not possible to account for their production? I think so; but must venture to say, that the molecular constitution of hydrocyanic acid, as at present admitted, is perhaps not accurate. As this acid is always obtained by putting cyanogen and hydrogen in contact, in the nascent state, it is natural to suppose that the cyanogen acts the same part in it as halogenous bodies in the hydracids. However, the facts which we have just observed lead us to believe that a nitruret of hydrogen, arising from a combination, may also be combined with carbon, and may produce hydrocyanic acid, without the previous formation of a binary molecule of nitrogen and carbon. We might therefore admit that a proportion of ammonia $N^2 H^6$, in contact with burning coals, is converted into $N^2 H^2 + H^4$, that these four atoms of hydrogen, forming two equivalents, are replaced by two equivalents of carbon, to constitute hydrocyanic acid, $N^2 H^2 C^2$, which immediately enters into combination with a proportion of undecomposed ammonia. In this case the carbon is substituted for a portion of the hydrogen of the ammonia, as chlorine is substituted for oxygen in the metallic oxides submitted to its action, the temperature being raised. Doubtless, also, the excess of ammonia greatly contributes to the production of the phenomenon, on account of its tendency to combine with the acids; without this excess of ammonia, hydrocyanic acid certainly would not be formed.

Under these circumstances is it more easy to explain the formation of hydrocyanate of ammonia, by representing its composition by cyanuret of ammonium? I do not think so. In that case, it must be admitted that one equivalent of ammonia is completely decomposed, that the nitrogen combines with the carbon, and that of the six atoms of hydrogen, four are disengaged, and two combined with a proportion of ammonia to convert it into ammonium. The reaction, thus considered, appears to me too complicated to be true.

The passing of ammoniacal gas over burning coals yields, in a short time, a great quantity of hydrocyanate of ammonia. This process is very simple, and I think it preferable to the others. The salt thus obtained appeared to me, as I have said, more stable than that prepared by saturating anhydrous hydrocyanic acid with ammoniacal gas.

Chlorine instantly attacks it with a disengagement of heat: hydrochlorate of ammonia is formed, as well as gaseous chloride of cyanogen, which I have collected and solidified by receiving it in a flask surrounded

by a frigorific mixture. Bromine has the same action on it as chlorine.

Hydrocyanate of ammonia readily dissolves in water, and does not seem to be immediately decomposed, as stated by Liebig in his Treatise on Organic Chemistry. I even think that this would be the only means of preserving it for any length of time without alteration. It is also very soluble in alcohol, and much less so in ether. It is a most violent poison. Five centigrammes were dissolved in water and given to a rabbit, which, immediately after having swallowed it, uttered a cry and died. I thought it would be interesting to know whether it would act as rapidly on dogs. One decigramme was given to a moderate-sized dog: the animal writhed for a few seconds, then fell down and soon died.

The energetic action of hydrocyanate of ammonia on animals made me believe that ammonia cannot be successfully employed as an antidote to hydrocyanic acid. With this idea I made some experiments which I need not describe, and which proved to me that ammonia acts only by its excitant properties.

M. Gay-Lussac is the first chemist who made known the hydrocyanate of ammonia: he did not attempt, on account of its great volatility, to determine its composition. Liebig says that it is formed of one equivalent of acid and one of base. The salt which I studied having been produced under new conditions, I wished to know if its composition was the same as that of the hydrocyanate of ammonia analysed by the learned chemist of Giessen. As soon as it was prepared, I enclosed it in a small flask which I perfectly sealed and accurately weighed. I dissolved in water a small quantity of the salt which it contained; I again weighed the flask; the weight which it had lost gave that of the hydrocyanate dissolved. By taking these precautions, I had no fear of loss arising from its volatility. The solution of hydrocyanate of ammonia was treated by a solution of nitrate of silver, which immediately formed in it a white precipitate of cyanuret of silver. The liquor was slightly acidulated by nitric acid.

1st. Exp. 0 gr. 090 of hydrocyanate of ammonia yielded dry cyanuret of silver..... 0 gr. 260
2nd. Exp. 8 gr. 082..... 0 gr. 245
3rd. Exp. 0 gr. 170..... 0 gr. 515

The mean of these experiments shows that 0 gr. 114 of hydrocyanate of ammonia produce 0 gr. 340 of dry cyanuret of silver, which represent 0 gr. 068 of hydrocyanic acid. These investigations lead us to conclude that this salt is composed of

One equivalent of hydrocyanic acid 342·389
One equivalent of ammonia..... 214·478

Its formula, therefore, is—

$C^2 N^2 H^2, N^2 H^6$.

ON THE ACTION EXERTED BY POTASSA ON CAMPHOR.*

BY M. Z. DELALANDE.

Setting out from the point of view which guided MM. Dumas and Stass in their experiments on alcohols, I tried whether camphor, which, in some of its reactions, is somewhat analogous to that class of bodies, would act in the same manner under the influence of potassa. For that purpose, I passed a current of the vapor of camphor over a mixture of potassa and lime fluxed together, then broken into small fragments and heated to about 300° or 400°. The camphor was entirely combined with the potassa, but no gas was disengaged. The mixture was treated with boiling water; the filtered liquor, saturated by an acid, allowed a white, crystalline, acid matter to deposit, which when washed and dried, may be distilled without leaving any residue.

The product thus obtained crystallises very well in alcohol, and especially in a mixture of alcohol and ether. In this state, its consistence is similar to that of camphor. This acid faintly reddens turnsole paper; it perfectly saturates bases. The analysis which I have made of it lead to the formula $C^{40} H^{36} O^4$. It is that of camphor + 2 equivalents of water. Thus, potassa does not exert on camphor the same action as on the alcohols. Camphor belongs to a peculiar group, in which, doubtless, many bodies which are very analogous to it will be ranked.

Campholic acid, as this new body is termed, presents much interest on account of the circumstances of its production, as well as by reason of the very remarkable transformations which it may be made to undergo. Unfortunately its study has not been developed as well as might have been desired, its preparation being less easy than would at first be supposed. Indeed, it is only with great difficulty that campholic acid could be obtained by acting on the camphor with potassa, under the ordinary pressure. To succeed perfectly, very peculiar circumstances of temperature are required. If we operate, on the contrary, in a corked tube, the reaction which produces the new acid is more easily obtained. By passing and repassing the vapor of camphor several times from one extremity of the tube to the other, over the alkaline mixture pre-

* *Annales de Chimie et de Physique*, Jan., 1841.

viously heated, a considerable portion of matter is attacked, and one might hope to extract 5 or 6 grammes of purified acid, from the contents of one tube. It is very clear that the necessity of conducting the experiment under the powerful pressure which is established in the interior of vessels is a great impediment. It is not always possible to avoid breaking them, and losing the contents.

Campholic acid enters into fusion at 60°C. and towards 250° C. it boils without alteration. It is insoluble in water, to which, nevertheless, it communicates a slight aromatic odor. Alcohol and ether dissolve it in great quantity.

I. 0·300 gr. of campholic acid, obtained by simple precipitation, gave 0·288 water and 0·768 carbonic acid.:

II. 0·300 gr. of the same, but previously sublimed, produced 0·286 water and 0·767 carbonic acid:

III. 0·300 gr. of a new product which had not only been sublimed, but had been crystalized in alcohol, and subsequently melted, yielded 0·290 water and 0·767 carbonic acid.

From these three analyses, the following composition is deduced:—

Carbon . .	70·83	70·74	70·74
Hydrogen .	10·63	10·58	10·73
Oxygen .	18·54	18·68	18·53
	100·00	100·00	100·00

Calculated according to the formula $C^{40} H^{32} O^2 + H^4 O^2$, or rather $C^{40} H^{36} O^4$, this composition would become:—

C^{40} . . .	1530·4	71·02
H^{36} . . .	225·0	10·40
O^4 . . .	400·0	18·58
	2155·4	100·00

CAMPHOLATE OF SILVER.

Obtained by decomposing the neutral campholate of ammonia by neutral nitrate of silver. This salt is presented under the form of white caseous crystals, very much disposed to enclose the nitrate of silver. To purify it, it must be dried, pulverized and submitted to fresh washings.

I. 0·316 gr. of this salt leave 0·122 of metallic silver, by combustion:

II. 0·735gr. of the same yield 0·412 water and 1·159 of carbonic acid.

Thus is obtained—

Carbon	43·6
Hydrogen	6·2
Silver	38·6
Oxygen	11·6
	100·00

By calculating the composition of this salt according to the formula $C^{40} H^{34} O^3$, AgO, would be obtained

C^{40} . . .	1530·4	43·78
H^{34} . . .	212·5	6·00
Ag . . .	1351·6	38·68
O^4 . . .	400·0	11·54
	3494·5	100·00

CAMPHOLATE OF LIME.

This is of a snowy white; crystalline, soluble in water, and much more so in cold than in warm.

It is obtained in a state of purity by treating campholic acid by an excess of ammonia, then adding to the almost boiling liquor, a solution of chloride of calcium.

Campholate of lime is precipitated under the form of a crystalline powder; it is washed with boiling water and dried at 100° C.

I. 0·4 grs. of this salt, prepared with the greatest care, yielded 0·327 water and 0·835 carbonic acid:

II. 1·204 gr. furnished 0.415 sulphate of lime:

Whence—

Carbon	57·7
Hydrogen	9·0
Oxygen	19·1
Lime	14·2
	100·0

By augmenting the carbon to the necessary quantity, according to the supposition that the lime remained entirely in the state of neutral carbonate after combustion, we should have

Carbon	60·75
Hydrogen	9·00
Oxygen	16·05
Lime	14·20
	100·00

The formula $C^{40} H^{36} O^4$, CaO gives

C^{40} . . .	1530·4	60·9
H^{36} . . .	224·6	8·9
O^4 . . .	400·0	16·0
CaO . . .	356·0	14·2
	2511·0	100·0

The different results which have just been detailed, authorize the adoption of the formula $C^{40} H^{34} O^3$, $H^2 O$ for the new acid derived from camphor.

We should have indeed:—

$C^{40} H^{34} O^3$, $H^2 O$. Campholic acid:
$C^{40} H^{34} O^3$, Ca O, $H^2 O$ Campholate of lime:
$C^{40} H^{34} O^3$, Ag O . Campholate of silver.

It was wished to submit these results to a new verification, by determining the density of the vapour of campholic acid. The following are the data of the experiment:—

Excess of weight of the phial	0·517gr.
Volume of the phial	201c.c.
Air left in the phial	0
Temperature of the bath indicated by an air Thermometer	287°
Barometer	0m.760
Thermometer	14° C.

Hence is deduced—

Weight of a litre of vapor	7·871 grs.
Density	6·058

We have by calculation,

40 vol. vapor of carb.	16·864
36 vol. hydrogen	2·477
4 vol. oxygen	4·410
	23·751
	$\frac{23·751}{4}$ = 5·938 calculated density.

CAMPHOLENE.

The action which anhydrous phosphoric acid exerts on campholic acid, seems to me to merit particular attention. Indeed, anhydrous phosphoric acid does not seem to act here by seizing merely the elements of water,—an action from which would result $C^{36} H^{36}$, that is to say, camphogen. Experiment does not confirm this.

By distilling campholic acid over anhydrous phosphoric acid, a liquid is obtained, which, purified by another distillation, boils at the fixed temperature of 135° C.

The following are the results of the analysis of this body:—

I. 0·212 grs. yielded 0·248 water, and 0·668 carbonic acid:

II. 0·275 grs. yielded 0·315 water, and 0·868 carbonic acid.

Whence—

	I.	II.
Carbon	87·2	87·3
Hydrogen	12·9	12·7

The matter analysed is evidently a hydrocarbon: as to the atomic relation between the carbon and the hydrogen, it is not sufficiently simple to enable one to resort to clearer analyses. We have indeed—

C^5	306·08	87·5
H^7	43·75	12·5
	349·83	100·0
C^9	344·34	87·4
H^8	50·00	19·6
	394·34	100·0

But the density of the vapor of this liquid shews that the latter proportion is the true one, and leads to the admission of the formula $C^{36} H^{12}$, for this body.

The following are the details of the experiment:—

Excess of weight of the phial	0·194 grs.
Temperature by the air thermometer	190° C.
Volume of the phial	178 c.c.
Barometer	0m. 753
Thermometer	17° C.
Air left in the phial	43 c.c.

Whence—

Weight of the litre	5·655
Density	4·353

We have, by calculation,—

36 vol. vapor of carbon	15·1776
32 vol. hydrogen	2·2016
	17·379
	$\frac{17·379}{4}$ = 4·344

By comparing this formula with that of campholic acid, we have the equation

$$C^{40} H^{36} O^4 - H^4 O^2 - C^4 O^3 = C^{36} H^{32}$$

to account for the formation of the hydrocarbon obtained.

CAMPHOLONE.

In distilling campholate of lime, an oil was collected, which, purified as much as the smallness of the quantity would allow, seemed to be *campholone*.

0·263 grs. yielded 0·275 water, and 0·787 carbonic acid: whence

Carbon	82·8
Hydrogen	11·6
Oxygen	5·6
	100·0

Campholone, $C^{36} H^{34} O = C^{40} H^{34} O^3 - C^2 O^2$, should contain—

C^{36}	1453·8	82·3
H^{34}	212·5	12·0
O	100·0	5·7
	1766·3	100·0

The composition of camphrone obtained by M. Frémy, is too far from the preceding numbers for these two products ever to be confounded together.

OBSERVATIONS RELATIVE TO THE ATOMIC WEIGHT OF CARBON, AND THE EMPLOYMENT OF SULPHURIC ACID FOR APPRECIATING THE WATER IN ORGANIC ANALYSES.*

BY J. PERSOZ.

By burning 2 gr. 5 of sugar by the sulphate of mercury, taking for a basis the atomic weight of carbon established by Berzelius, I ought to have obtained 3 lit. 868 of sulphurous and carbonic acid gases at 0° and 0·76 of pressure: taking for a basis that established by M. Dumas, I should have obtained 3 lit. 912; whereas, experiment gave 3 lit. 919.

Admitting the accuracy of Liebig's atomic formula of sugar, of which I have made use in these calculations, the experiment which I have just indicated of the combustion of 2 gr. 5 of sugar, is one more proof, if more be required after the direct and delicate experiments made by MM. Dumas and Stass, (see *The Chemist*, No. XV., page 65), in favor of the necessity of reducing the atomic weight of carbon. The only thing which remains to be decided, and which is not the least important, is the accurate determination of the equivalent of carbon. Must the number 75, admitted by MM. Dumas and Stass, be adopted, or must another be sought? It is a question with which I am now occupied, and for the solution of which I have undertaken experiments, which I shall very soon have the honor of laying before the Academy. At present I can announce to it, that in all the combustions made by means of sulphate of mercury I have collected more carbonic acid than calculation indicated, adopting the number 75 for the atomic weight of carbon. In investigating the cause of the disagreement between my results and those obtained by MM. Dumas and Stass, I could find it only in the perfection which those gentlemen wish to attain in the mode of collecting the water in the combustion of carbon and organic matters. In order to appreciate the slightest traces of carbonic acid or water, MM. Dumas and Stass passed the products of the combustion through a heap of pumice stone moistened with sulphuric acid. The carbonic acid gas thus deprived of water by its contact with sulphuric acid, is afterwards absorbed by a solution of caustic potassa to be weighed.

Now, as it results from my experiments that at the temperature of + 11° C., and at the pressure of 0m.757, one volume of concentrated sulphuric acid absorbs exactly one volume of carbonic acid, it is evident that the employment of sulphuric acid for appreciating water in organic analyses, can lead only to false results.

M. Dumas made the following observations to the Academy on the subject of the above communication:—

"It is evident that M. Persoz confirms the necessity of renouncing the old atomic weight of carbon, and that he has ascertained, as well as his processes permitted him, the practical accuracy of the new one. It remains to be known whether in a speculative point of view the round number 75 must be stopped at, or another, which his experiment does not decide.

"Indeed, in burning sugar and measuring the volume of the gas which results, M. Persoz is obliged to suppose:—

"1st. That his sugar is pure, and that he has reduced the weight *in vacuo*;

2nd. That his bell-glass is accurately graduated;

"3rd. That the co-efficient of the dilatation of gases is accurately known, and that he can answer for the temperature of his gases to less than a quarter of a degree;

"4th. That Marriotte's law is applicable to carbonic and sulphurous acid gases, contrary to M. Despretz's experiments, and that the pressure to which his gases were submitted is known to less than a third of a millimetre;

"5th. That his gases were absolutely dry;

"6th. That the density of carbonic and sulphurous acid gases is perfectly known; which is not true, at least, so far as regards carbonic acid gas.

"In the midst of all these difficulties, it is surprising that the result which he announces differs only $\frac{1}{100}$ from that which we obtained in experiments free from any data, by simply weighing the carbon burned and the carbonic acid obtained.

We cannot admit that the intervention of sulphuric acid could cause any error in our experiments; for if we employed four or five cubic centim. of sulphuric acid spread over pumice stone, to collect the traces of water which might have resulted from our combustions of the diamond or anthracite, that acid retained, after the experiment, exactly the same weight as it had before.

"The result is easily understood, for if sulphuric acid were, at first, to have dissolved a little carbonic acid, like all other liquids, the oxygen and air which we successively drove through the apparatus could not fail to displace them.

"With the precautions which we have indicated, and which, for other reasons, are indispensable, the employment of sulphuric

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* *Comptes Rendus*: No. 11, March 15, 1841.

acid cannot present any chance of error in the way pointed out by M. Persoz. That learned chemist will without difficulty be convinced, if he will be kind enough to repeat our experiments, or at least some of our analyses."

PHENYLE AND ITS COMPOUNDS.*

BY M. A. LAURENT.

I have discovered, in the oil from lighting gas extracted from coal, a new body which I call *hydrate of phenyle*. It is crystallised, and volatile without decomposition; it acts in some measure the part of an acid. Its properties very greatly resemble those of creosote; they differ only in two or three fundamental reactions.

Its formula may be represented by

$$C^{24} H^{10} O + H^2 O.$$

With potassium, it forms, by losing two atoms of hydrogen, a crystallised compound, whose formula is

$$C^{24} H^{10} O + K O.$$

It directly combines with the powerful bases. Its combination with baryta is represented by

$$C^{24} H^{10} O, H^2 O + Ba O.$$

With sulphuric acid, it forms a combination which I call *sulphophenic acid*. It is a liquid body, forming with bases crystallisable salts. The formula of *sulphophenate of baryta* is

$$(C^{24} H^{10} O, H^2 O + S O^3) + (BaO, S O^2).$$

By distillation it disengages hydrate of phenyle.

Sulphophenate of ammonia, treated by nitric acid, is metamorphosed in a very simple and remarkable manner: sulphuric acid, water, ammonia and carbazotic or picric acid are obtained:—

$$\underbrace{(2 S O^3 + C^{24} H^{10} O, H^2 O + H^6 N^2 O)}_{\text{sulphophenate of ammonia}} + 3 N^2 O^5 = 2 S O^3 + H^6 N^2 O + 3 H O^2 + \underbrace{(C^{24} H^4 O (N^2 O^4) + H^2 O)}_{\text{picric acid.}}$$

Chlorine and hydrate of phenyle form *chloro-phenesic acid*, a liquid compound forming crystallisable salts: its formula is

$$C^{24} H^6 Cl^4 O + H^2 O.$$

It is hydrate of phenyle in which four atoms of hydrogen have been substituted by four of chlorine.

By continuing the action of chlorine on the hydrate of phenyle, *chlorophenisic acid* is obtained: it is a crystallised substance, volatile without decomposition, and its formula is represented by

$$C^{24} H^4 Cl^6 + H^2 O.$$

It is hydrate of phenyle in which six atoms of hydrogen have been replaced by six of chlorine.

Chloro-phenisate of barium .. $= C^{24} H^4 Cl^6 O + Ba O$,
Chloro-phenisate of ammonia $= C^{24} H^4 Cl^6 O + H^6 N^2 O$.

In treating hydrate of phenyle by bromine, *bromophenesic acid* is obtained. It is a crystallised body, similar to chlorophenesic acid, and its formula is

$$C^{24} H^4 B^6 O + H^2 O.$$

By treating hydrate of phenyle with nitric acid, a new acid is obtained, which I call *nitro-phenesic acid*. It is yellow and crystallised; it forms with bases salts of great beauty: they are yellow, red, or orange. They detonate with heat. The formula of this acid is—

$$C^{24} H^6 (2 N^2 O^4) O + H^2 O.$$

It represents hydrate of phenyle in which two equivalents of hydrogen have been substituted by two of hyponitric acid.

$$(C^{24} H^{10} O, H^2 O) + 2 N^2 O^5 = [C^{24} H^6 (2 N^2 O^4) O + H^2 O] + 2 H^2 O.$$

Nitro-phenesic acid is destined to become common in laboratories, and perhaps to receive applications in the arts.

* *Comptes Rendus*; No. 10, March 8, 1841.

Representing anhydrous nitro-phenesic acid by nPe, we have for

Nitro-phenesate of potassa	nPe + K O + Aq.
Dry nitro-phenesate of barium	nPe + Ba O.
Nitro-phenesate of barium dried at 100° C.....	nPe + Ba O + 3 Aq.
Crystallised nitro-phenesate of barium.....	nPe + Ba O + 5 Aq.
Dry bibasic nitro-phenesate of lead	nPe + 2 Pb O.
Crystallised bibasic nitro-phenesate of lead....	nPe + 2 Pb O + 4 Aq.
Crystallised sesquibasic nitro-phenesate of lead	2 nPe + 3 Pb O.

By treating hydrate of phenyle with an excess of nitric acid, picric acid is obtained, which I call *nitro-phenisic acid.*

Its formula is—

$$C^{24} H^4 (3 N^2 O^4) O + H^2 O.$$

It represents hydrate of phenyle in which three equivalents of hydrogen have been replaced by three of hyponitric acid.

$$C^{24} H^{10} O, H^2 O + 3 N^2 O^5 = [C^{24} H^4 (3 N^2 O^4) O + H^2 O] + 3 H^2 O.$$

Representing the anhydrous acid by the symbol nPi we have for the following salts:—

Nitro-phenisate of potassa = nPi + K O.

This composition is the same as that given by M. Dumas:—

Crystallised nitro-phenisate of silver.....	nPi + Ag O + Aq.
Anhydrous nitro-phenisate of barium	nPi + Ba O.
Dried nitro-phenisate of barium.....	nPi + Ba O + 2 Aq.
Crystallised nitro-phenisate of barium	nPi + Ba O + 6 Aq.
Sesquibasic nitro-phenisate of lead.....	nPi + 3 Pb O + 3 Aq.
Bibasic	nPi + 2 Pb O + 2 Aq.
Quintibasic.....	nPi + 5 Pb O.

ON MINIUM.*

BY M. LEVOL.

Although minium has been made the subject of investigation by many chemists, there still is a difference of opinion as to the manner in which its true constitution, and even its analysis should be represented. Having had occasion to examine several samples with respect to their commercial value, I was in a situation to make observations which have induced me to undertake the work whose results are here given; I do so with confidence, only because they appear to me to lend support to the most generally admitted opinion concerning minium, which regards it, not as an oxide distinct from the two oxides of lead, PbO and PbO^2, but as a combination of these oxides, in an uniform and definite proportion.

The most important scientific work relative to this substance is that of M. Dumas, from which it results that this product of the arts always has the composition PbO + 2 PbO, when properly purified, or saturated with oxygen. I have constantly found this proportion in analysing samples of minium obtained under new circumstances, and by two different new processes, which I may here describe.

The first consists in calcining, in a silver or platinum crucible, a mixture of 100 parts of protoxide of lead,—procured by calcining ceruse,—25 of chlorate of potassa and 200 of saltpetre; the latter salt is used in order to give greater fluidity to the liquid, without needlessly increasing the quantity of the chlorate of potassa.

By operating in this manner, the action of the oxygen on the oxide of lead is so effectual, that it is converted into the puce oxide: this oxide may therefore be prepared with the greatest facility. If we go farther, if the temperature be raised to dark red, the swelling diminishes, the matter thickens, and minium is formed.† To obtain pure minium, with the composition indicated, it is sufficient to boil on the residue, water containing caustic potassa or or soda, and to well wash it. The product is very finely divided, and of a beautiful, slightly

* *Annales de Chimie et de Physique;* Deuxième Series, tome lxxv.

† The temperature must be raised until it begins to be decomposed in several points, towards the edges, in order to be certain that no puce oxide remains. If it be proposed to prepare the latter oxide, the crucible must be withdrawn when the matter has acquired an apparently homogeneous black tint, which commonly happens, with the above indicated proportions, when the whole mass is in full fusion: it is easy thus to convert into pure binoxide, at least nine-tenths of the protoxide of lead employed, by treating the residue with nitric acid, after having well washed it. Peroxide of lead obtained in this manner is almost black.

orange red, like that of the best minium of commerce.

Minium may also be obtained in the humid way, by boiling, for one or two hours, a solution of an alkaline plumbate, on finely powdered binoxide of lead:* the color of the binoxide gradually becomes brighter, and finally a powder of an ochrey red is obtained. This is minium, generally containing a little puce oxide which has been acted on by the plumbate; it is easily freed from this by digesting it, by means of heat, in oxalic acid, which destroys the puce oxide without attacking the combination, and the oxalate of lead may easily be removed by means of caustic soda or potassa. The product thus obtained always has a deeper red color than that prepared in the dry way, but it becomes brighter and resembles it more, when ground in water; moreover, it has exactly the composition of the first minium, and the difference in the tint seems to be owing only to the texture; indeed, there is some appearance of crystallisation about minium obtained in the humid way.

My analyses were made by leaving the samples of minium for 24 hours in contact with an excess of nitric acid at only 15° B, and without elevating the temperature, for otherwise a portion of the binoxide is decomposed, and a small quantity is dissolved which gives to the liquor a violet color. After this, I had only to weigh the binoxide forming the residue; but I took no account of its weight until I had ascertained that it was completely soluble in nitrate of protoxide of mercury, which has no action on minium.

The motives which led me to admit as most probable the opinion which regards minium as a combination of the oxides of lead, are as follows:—

Admitting that minium is a peculiar oxide, intermediate between these two oxides, an inexplicable thing, the protoxide of lead being calcined with chlorate of potassa, is readily peroxidised; but we cannot, in the same manner, as I have ascertained, convert minium into the puce oxide.

Oxalic acid makes the puce oxide immediately pass to the state of the protoxide, but does not alter minium; which is, at the same time, a means of purification, and a good characteristic of minium. From the fact that this acid, as well as the nitrate of mercury and sulphurous acid, removes the binoxide in the state of protoxide and has no action on the minium, it may again, in my opinion, be inferred, not only that minium is a combination of the two oxides, but that this combination is possessed of remarkable stability.

* Pure plumbate may be used, but it is more convenient to employ a liquor obtained by dissolving in water five or six parts of crystallised nitrate of lead to one part of binoxide, to which is added sufficient caustic soda or potassa to redissolve the hydrate of lead.

ON ALBUMEN, FIBRIN, THE WHITE MATTER OF THE GLOBULES OF THE BLOOD, AND CASËIN.†

LETTER FROM DR. JUSTUS LIEBIG TO M. PROSPER DENIS.

At length I have the satisfaction of announcing to you that all your experiments on fibrin and albumen, with respect to their identity and composition, have been found very accurate. We entirely dissolved pure fibrin in a saturated solution of nitre, keeping them together both at a temperature of from 50 to 56° C. The fibrin at first became gelatiniform, and left only a few gelatinous flakes. The filtered liquid possessed all the properties of albumen. We succeeded without employing caustic alkali, which at first appeared to me indispensable and decisive. We have also remarked that boiled fibrin does not dissolve. The composition of dissolved fibrin (changed into liquid albumen) was exactly the same as of ordinary fibrin and albumen. The formula

$$C^{48}\ H^{74}\ N^{14}\ O^{11}$$

expresses the relative proportion of its elements.

We have likewise succeeded in precipitating albumen under the form of globules, by adding a sufficient quantity of water to serum rendered neutral by an acid; and we were enabled to extract the fibrin from the globules of the blood, by the process which we have indicated.

By adding to albumen a little caustic potassa, it was precipitated under the form, and with the properties, of casëin, by means of alcohol.

I am happy, Sir, to have been able to contribute a little to put your important discoveries beyond doubt. I am preparing a Memoir in which I shall detail the analyses undertaken with this view.

† *Comptes Rendus de l'Academie des Sciences*, No. 12, Paris, 22 Mars, 1841.

Composition of Fibrin, rendered soluble according to the Method proposed by M. Prosper Denis, and precipitated from its Nitrous Solution by cold Alcohol, and treated by boiling Alcohol and Ether.

	1st Analysis.	2d Analysis.	3d Analysis.	
Carbon . . .	54·508	55·002	54·511	Incombustible matter, or ashes, 1·351 per cent.
Hydrogen . .	6·874	7·280	6·974	
Nitrogen . .	18·032	18·197	18·037	Proportion of carbon to nitrogen :: 7 : 1.
Oxygen . . .	20·586	19·521	20·478	

Fibrin of the Blood directly treated by Water, cold Alcohol, and boiling Alcohol and Ether, without previous Solution.

Carbon	54·988	C : N=7 : 1.
Hydrogen . . .	6·876	
Nitrogen . . .	18·190	
Oxygen . . .	19·946	

Albumen prepared by dissolving in water, Serum dried in the open Air, at the ordinary Temperature, by afterwards precipitating it by cold Alcohol, and by purifying it by boiling Ether.

	1st Analysis.	2d Analysis.	
Carbon .	54·726	54·765	C : N=7 : 1.
Hydrogen .	7·312	7·065	
Nitrogen .	18·105	18·118	
Oxygen .	19·857	20·052	

Serum of the Blood treated, without previous Solution, by cold Alcohol and boiling Ether.

Carbon . . .	55·233	C : N=7 : 1.
Hydrogen . . .	7·156	
Nitrogen . . .	18·275	
Oxygen . . .	19·336	

All these analyses were made in the laboratory of Giessen, by Dr. Scheerer. I have taken every precaution to ensure accuracy.

ON THE FORMATION OF LAMPIC ACID.*

BY R. F. MARCHAND.

Lampic acid, which consists, according to the investigations of MM. Stass and Martens, of acetic, formic, and aldehydic acids, but in proportions varying according to the temperature of the helix of platinum, may be obtained in the state of a mixture in uniform proportions in making Leidenfrost's experiment with alcohol or ether.

When alcohol or ether is poured, drop by drop, into a heated platinum capsule, the liquid runs round and is agitated on the metallic surface without being sensibly evaporated, and, besides, presenting the appearances already described in analogous phenomena. The products may easily be collected by covering the capsule with a tubulated retort with the bottom detached: from time to time a fresh quantity of liquid is poured in. Thus may be procured, in a short time, a considerable quantity of distilled liquor: this, as may easily be proved, is no longer alcohol: it possesses all the properties of lampic acid. The relative proportion of the mixed elements of this acid depends on the temperature to which the platinum capsule is brought. The author has proved that the same result may be obtained by substituting for the platinum capsule, polished copper or iron ones: it is important that the metallic surface should present no asperities, otherwise Leidenfrost's experiment does not succeed; thus these effects stop when sand or pounded glass is spread over the metallic surfaces. The temperature at which the phenomena commence is about 60° C.

The author regards the explanation which Buff has given of these phenomena (*Poggendorff's Annales*, Vol. xxi. p. 591) as perfectly satisfactory.

* *Annales de Chimie et de Physique.* Deuxième Series, tome lxxiv.

NEW INVESTIGATIONS CONCERNING INDIGO.*

BY M. A. LAURENT.

I have the honour of communicating to the Academy the extract of a work which I have undertaken relative to indigo, and for which I now desire to take date, the great number of new combinations which I have obtained not allowing me to foresee at what time this work will be completed.

The composition of indigo has been determined by M. Dumas, who represents it by the formula

$$C^{32}\,H^{10}\,O^{2}\,N^{2}.$$

According to Erdmann, indigo contains less oxygen: his formula would be

$$C^{64}\,H^{20}\,O^{3}\,N^{4}.$$

Adopting the new atomic weight of carbon given by MM. Dumas and Stass, these formulæ cannot agree with the results of experiment; they present a hundredth too much of carbon.

I have analysed perfectly pure sublimed indigo, by the new methods of analysis, and I found that its composition might be exactly represented by the formulæ to which M. Dumas was led by adopting the old atomic weight of carbon.

By oxidising indigo, I discovered a new substance crystallised in large red prisms, similar to those of the red ferro-cyanuret of potassium. I call it *isatine*: its composition is represented by

$$C^{32}\,H^{10}\,N^{2}\,O^{4},$$

that is to say, indigo plus two atoms of oxygen. This formula, as is evident, does not agree with the theory of substitutions, for it must in that case be thus represented:

$$C^{32}\,H^{8}\,N^{2}\,O^{3} + H^{2}\,O:$$

but this body does not contain water; on the contrary, it absorbs one atom under the influence of bases, forming a new acid which I call *isatic acid*, the formula of which, in the salts, is represented by

$$C^{32}\,H^{12}\,N^{2}\,O^{5}.$$

Isatine and ammonia give rise to several compounds, and among others to a new acid which may be regarded as a compound of 1½ atoms of isatine with 1 atom of water—

$$C^{48}\,H^{17}\,N^{3}\,O^{7}.$$

Isatine and chlorine form two remarkable compounds discovered by Erdmann, by making chlorine act on indigo, under the influence of water—*chlorisatine* and *bichlorisatine*.

According to Erdmann, the formula of the first would be

$$C^{32}\,H^{8}\,N^{2}\,O^{3}\,Cl^{2},$$

and that of the second,

$$C^{32}\,H^{8}\,N^{2}\,O^{3}\,Cl^{4}.$$

According to my analyses, chlorisatine would be represented by

$$C^{32}\,H^{6}\,N^{2}\,O^{4}\,Cl^{2}$$

and bichlorisatine by

$$C^{32}\,H^{6}\,N^{2}\,O^{4}\,Cl^{4}.$$

Bromine and isatine yielded me the same compounds as those discovered by Erdmann by the action of bromine on indigo.

According to him, bibromisatine would be represented by the formula

$$C^{32}\,H^{8}\,N^{2}\,O^{3}\,B^{4},$$

and according to my analyses there would be two atoms less hydrogen.

Finally, I have long since announced that, in general, bodies obtained by equivalent substitution should be isomorphous. M. De la Provostaye has given us the first example in support of this idea, in making known the isomorphism of oxamethane and chloroxamethane. I found that chlorisatine and bichlorisatine had exactly the same angles. These are good examples, but they are not the only ones: I will give others in my next Memoir.

* *Comptes Rendus*, No. 12; March 22, 1841.

PROCESS FOR OBTAINING POTASSIUM.*

BY ROBERT HARE, M.D.

In evolving potassium, agreeably to Brunner's plan, I have substituted for the luting usually employed to protect the iron bottle, a cylinder of iron, which is made to surround the iron bottle; also a disk of the same metal of a diameter and thickness equal to that of the cylinder.

The disk is supported by bricks of kaolin. The bottle being vertical, the blast acts more equably on the surface of the iron, and the operator can, by additional fuel, protect any part from that undue exposure to which the under surface is always liable, when the bottle is horizontal.

The potassium is received into an iron tube, of which the bore is two inches in diameter. This tube screws at one end into the small bottle, and at the other is closed by a perforated plug, terminating in a small orifice. To this a leaden tube is fitted, which is so adjusted by bending, as to cause the vapour resulting from the burning of the gas, to go into the ash-hole. By these means the hydrogen, being ignited as soon as it comes over, serves as an index of the success and progress of the process. In this way, no resort to naphtha is in the first instance necessary. The potassium is extricated from the tube by cooling it by infusion of water, detaching it from the bottle, and then closing the end thus exposed by a cap, in which a suitable conical female screw is wrought.

The part of the tube containing the potas-

* From *Silliman's Journal*.

sium is then made in a vertical position to occupy the axis of a cylindrical furnace, the end terminating, as above mentioned, in a tapering plug, being lowermost, and projecting below the bottom of the furnace. Before the temperature reaches redness, globules of the metal begin to descend; but to extricate the last portion a white heat is requisite. The potassium may be received in bottles, kept full of hydrogen by a constant current, or in naphtha. The first portion, which descends before the temperature is high, can be more easily received without naphtha than the latter portion.

II. CHEMICAL MANUFACTURES.

APPLICATION OF THE DAGUERREOTYPE TO THE TAKING OF LIKENESSES FROM THE LIFE.*

BY J. F. GODDARD, ESQ.

MR. GODDARD, who is engaged by the patentees to work the process, delivered a lecture at the Royal Institution on the above subject, on the 26th of March; it is accomplished by Wolcott's reflecting apparatus, and is secured by patent. It is hardly two years since it was first announced in Paris that M. Daguerre had made a most wonderful discovery, by means of which he was enabled to fix the images and pictures obtained in the camera obscura, and thus, by the action of light, produce designs in which the objects preserve their forms with the strictest mathematical precision, even to the most minute details.

The extraordinary interest and curiosity which this announcement created, not only in Paris, but throughout Europe, and in England more particularly, is generally known. Nor was this curiosity and interest in the least diminished or disappointed when the secret of the process was made known. For such was the extraordinary accuracy with which every object in nature was copied—the perspective represented—the most delicate gradations of line and shadow brought out; the faithfulness of the representations as a whole; to say nothing of the singular novelty of the process by which these beautiful effects were produced, that it became the all-absorbing subject of attention at the time.

The vast importance of this discovery in the arts and sciences was evident, and the resources and facilities that it would afford in their study were incalculable, so much so, that a bill for rewarding its authors, MM. Daguerre and Niepçe, was proposed by Louis Philippe, and adopted by a special commission charged with its examination, on condition that the secret was published for the benefit of the *whole world*. But, strange as it may appear, it is a fact recorded by Daguerre himself, that whilst M. Duchâtel, the Minister of the Interior, was urging upon the Chamber of Deputies as reasons why this extraordinary and liberal measure should be adopted by them, that "unfortunately for the authors of this beautiful discovery, it was impossible for them to bring their labour into the market, and thus indemnify themselves for the sacrifices incurred, *as the invention did not admit of being secured by patent.*"

At this very time, Niepçe, after obtaining Daguerre's sanction, which was done only with very considerable delay, was actually contradicting this statement of the Minister by commissioning an agent in London to take out a patent for this country. The consequences of which have probably not been very satisfactory, as it necessarily put at once a check to anything like speculation here; but not so in other countries. To America is due the honour of having first successfully applied the discovery to the taking of portraits from the life. The apparatus by which this is effected has been patented in this country by Mr. Beard, a gentleman who has spared no expense in bringing it to perfection; but the invention being a communication from a foreigner residing abroad, viz. Mr. Wolcott, of New York, and consisting in very important improvements in Daguerre's process, it is proposed to substitute a name better suited to the principles of English nomenclature, than that of Daguerreotype, which, although a favourite word on the Continent, is by no means suited to our views, and has no reference whatever to the principles of the subject; the patentees have therefore adopted the term *Photography*, which signifies that the pictures are produced by the action of light.

The various means that have hitherto been adopted, and the more recent improvements enumerated, were the principal points entered on by the lecturer in treating the subject, the details of which were the following:—

* As given in the *Inventors' Advocate*, No. 88. In this excellent periodical will be found reports of the meetings of all the Metropolitan scientific bodies. It is one of the most ably conducted weekly scientific journals of the day.

Images of objects may be obtained in two ways: by refraction through a lens, and by reflection from a mirror. Mr. Goddard then proceeded to describe the camera as originally constructed by Daguerre, and also the minutiæ requisite to be attended to, in preparing the plates, on which the image is to be reflected. The plates used are made of copper, silvered on one side only, the purer the silver the better — as the effect depends to a very great extent on the perfection of the polish and the uniformity of their surfaces. To prepare the plates for the camera (after the polishing has been effected) they are gently washed over with dilute nitric acid, the proportion as suggested by Daguerre answering the purpose, viz. one part of acid to 16 parts of water; this solution is gently and uniformly applied to the polished surface by means of a piece of cotton moistened with it;—the plate is afterwards wiped quite dry by using several pieces of dry cotton; finely divided pounce (sifted from a linen bag) is distributed over the surface, and rubbed also with cotton: this process Daguerre recommends to be performed three or four times. This completed, the plate is exposed to the vapour of iodine, in a box for the purpose; in a short time the surface becomes coated with a pale yellow or golden tinge, and is then fit for the camera. The operator then removes it in the dark, and introduces it by means of an apparatus into the place previously occupied by a plate of ground glass, on which the reflection had been properly adjusted according to focus. After it has remained in the camera for a given time, depending on the power of the light, it is removed and exposed to the vapour of mercury (heated to about 690 degrees Fahr.) in the mercurial box. From this it is placed in a trough, and the surface covered or washed with a hot and weak solution of the hyposulphite of soda, which permanently fixes the object. All that which we have just described must be performed in the dark, and constitutes the process originally made use of by Daguerre and Niepçe. It is not altogether applicable for taking portraits from the life.

It is to Mr. Wolcott, an optician of New York, that the world is indebted for the working out of the idea of taking portraits from the life; who, having speculums on hand, was led to experiment with them on a plaster bust, and he succeeded beyond all expectation on the first trial, the plate having been exposed in the instrument only five minutes; the diameter of the speculum first used was about seven inches.

To procure the silver plates then became a matter of some little difficulty, after all those of French manufacture had been used. Mr. Johnson adopted a method by which he obtained good surfaces; and this he accomplished by plating, to some thickness, silver on copper, and polishing the surfaces of two pieces as high as it was possible. He then applied the *two* polished silver surfaces together, and had them passed between the rollers of the rolling mill; after the pieces had been reduced to the proper degree of thickness, the surfaces of both the plates were found to possess a polish far superior to that obtained in the usual way. Mr. Goddard considers that the plates manufactured at Birmingham, under the superintendance of Mr. Johnson, are equal to those procured from Paris.

The process now adopted to finish plates so prepared, is to use, instead of pounce, finely divided tripoli, after the dilute nitric acid; this ought to be done just before it is used, otherwise, if prepared long before, the air appears to have some peculiar effect on the surface, the rationale of which is not altogether understood. Finely divided *rouge* and *charcoal* applied on *black velvet* are the materials used to finish up the polish, which gives it a dark hue; so much of the effect of the picture depending on the depth of shade produced.

A bust was then taken by the oxy-hydrogen light in the space of three minutes. The time formerly required by the old process was about five or six minutes in the middle of the day; but with the more recent improvement of Mr. Goddard (we believe the *iodide of bromine*) he is enabled to take likenesses in the space of from two or three seconds, to one and a half, or two minutes.

So many effects are produced of a varied character, by the mode thus adopted in preparing the plates, and almost every result may be obtained that the artist may desire, some of them resembling even the style of Rembrandt, &c. &c.

As it is necessary that the individual to be taken should sit in as strong a light as possible, it has been found expedient to glaze the sky-light in front of which he sits, with deep blue glass; by this arrangement the light is moderated to a considerable degree, enabling those of weak sight to bear it without inconvenience; and the blue glass also performs a part of some importance in the process, by transmitting the *chemical* rays, and obstructing to a certain extent the *luminous* rays.

In conclusion he considered that the invention as now practised would prove serviceable to artists, and especially miniature painters, as it would enable them to flatter their patrons, at the same time retaining the character so as to give a correct likeness.

ON THE PRESERVATION OF MEAT FOR FOOD.

BY M. GANNAL.

The following is a translation of an abstract of a memoir read before the Royal Academy of Sciences, Paris, by M. Gannal, inventor of the well-known process of embalming, as given in the *Compte Rendu* of March 22. The author commenced by recapitulating some of the inconveniences presented by the most commonly employed processes for preserving meat; he remarked that, whatever substance be employed, great advantages result from its being introduced by injection, instead of making it slowly penetrate, as in the ordinary process of salting, by imbibition from within or without.

"By injection will be obtained, besides the saving of time and money, an uniform distribution of the preservative substance, while by maceration, especially if large pieces be acted on, the portions nearest to the outside, become super-saturated with that substance, before the internal parts have received sufficient to prevent their decomposition."

Then, devoting himself to the examination of the substances which might be used instead of common salt, M. Gannal referred to the soluble salts of alum, substances which have the power of preventing the putrid fermentation of animal matter, but some of which communicate to it an unpleasant taste, or injurious properties. According to him, none of these inconveniences exist in the chloride of aluminum.

"I was," said he, "theoretically convinced that flesh preserved by this salt in a state of purity, should acquire no taste, because, in the first place, the quantity used is very small, and besides, from the reaction which is operated, there results only a small quantity of chloride of potassium, sodium, or calcium—salts which are daily employed in our households, in the grey salt consumed in our kitchens. As for the portion of alumina introduced into and combined with the animal matter, it is met with in such small quantities that it need not be stopped.

"Alum is employed in medicine, and acts as an astringent; but in this case the argillaceous earth is combined with an acid, while in meat it is nothing more than an earthy powder, without action on the animal economy. On this subject, it may be affirmed that the inhabitants of the borders of the Seine, who drink the water of that river at least half the year, daily drink ten times more aluminous earth than they would take by habitually eating meat prepared by my process.

"Experiments on the degree of concentration to be given to my liquid to effect the preservation of meat, without uselessly adding too large a quantity of salt, have shown me that the suitable solution should mark 10° of Baume's Areometer. Now one kilogramme of this salt, as prepared by M. Guerin, is sufficient for six quarts of water; from nine to twelve quarts of this liquid are required for the preservation of an ox, that is to say, from one kilogramme and a half to two kilogrammes are employed.

"The *modus operandi* is very simple. When the animal is felled by a blow on the forehead, the carotid and the jugular are opened on one side, by making an incision from the larynx to those two vessels; then, by a brisk movement, the cutting instrument is raised, which divides all the parts, and allows the whole of the blood to run out.

"When the blood ceases to flow, a syphon is introduced into the carotid, a ligature is made at the superior part to prevent the liquid from running out, both the apertures of the jugular are tied, and the injection is then introduced.

"The most suitable instrument for this operation is a tube of waterproof linen, of two metres in length, three centimetres in diameter at the bottom, and five or six centimetres at the top; this tube must be fixed to the syphon, which should be of wood or horn.

"As soon as it is perceived that the animal is well injected, that is to say, when no more liquid goes in, and when the subcutaneous veins are well swelled, the tube must be squeezed between the finger and thumb, which must be made to descend with pressure for the length of the column; by this means the quantity of the liquid is increased in the interior of the animal. A ligature is made below the syphon, which is then withdrawn; twenty minutes afterwards the animal is skinned, then emptied, and, finally, cut up in the ordinary way; there is no necessity for removing the bones and fat, as in the process of salting.

"When the animal has been well bled, and the injection well performed, it is scarcely perceptible that the animal has undergone any preparation at all. The only part where the injection leaves traces is in the lungs, which are dried up and discolored.

"When the animal is cut up and hung in the air, the flesh is left in this state until it is cold; the only precaution to be taken is to prevent the flies from getting at it.

"Meat which it is wished to preserve for a certain time, requires no other preparation: it is sufficient to hang it in a dry and airy place. When it is intended to preserve it more than fifteen days, the flesh must be washed in a solution at ten degrees of chlo-

ride of sodium, and an equal quantity of chloride of aluminum. When this is done, the meat is applied to the purposes for which it is intended. That which is to be dried, must be hung in a chamber heated by means of a current of hot air, or air charged with wood smoke, or even in the open air; but in this case, flies must be guarded against.

"When this meat is dried, it is sufficient to pack it in barrels hermetically sealed, and to keep the latter in a dry place.

"To use this meat, all that is required is to macerate it for four-and-twenty hours, and as it is not salted, the swelling may easily be effected in sea water.

"When it is wished to preserve fresh meat, it is piled up in barrels, as is done in the common method of salting; when the cask is full it is closed up; then it is filled with either a saturated solution of chloride of sodium, with the washing mixture, or simply with dry chloride of sodium. The three means have given good results.

"This bath contributes but little to the preservation, but it prevents the vegetation of *bisrus*: without this precaution, the meat would become musty.

"Among the experiments which I made, a barrel was opened after three months, and a leg of mutton was taken out which was roasted and eaten, and pronounced very good by twelve persons; but the barrels having been badly closed the liquid of the bath was lost, and the meat was covered with mould, but was not decomposed."

A committee, consisting of MM. Thenard, Magendie, Dumas and Séguier, has been appointed by the Academy to investigate the merits of this process, and to report thereon.

METHOD OF OBTAINING STEEL OF DIFFERENT COMPOSITIONS AND QUALITIES.*

BY COLONEL ANASOF.

In a memoir on the manufacture of cast steel at St. Zlataoust, the imperial manufactory of swords and of iron, situated in the southern part of the Oural mountains, Colonel Anasof describes the processes adopted in that manufactory to produce the steel in earthen crucibles by the fusion of bars of iron and steel by means of blast furnaces. The peculiarity of this process consists in this; that iron is put into the crucibles covered with charcoal to submit it to a kind of cementation, whilst in England steel previously cemented is employed. In other respects there is nothing new in the method adopted, but it may be serviceable to state, briefly, the means indicated by the author of the memoir of obtaining steel of different varieties in its composition and qualities. The following are his observations on this point:—

"The processes adopted for the fabrication of steel are sufficient to show the principal causes which tend to vary the qualities of this metal; as, for example, the quantity of carbon absorbed by the iron and the nature of the iron itself. As the first of these causes may be regulated at will, it requires no explanation, and the second need not now be considered. I will therefore confine myself to the rules that I have formed, which are the results of a great number of experiments.

"1st. The purer the iron, that is, the more free it is from other substances, the better will be the steel procured from it; but the cementation will require longer time.

"2d. All qualities of soft iron are not to be preferred to brittle iron; for if the hardness of the latter be caused by the carbon it contains, it is preferable to soft iron, of the same qualities in other respects.

"3d. The aptitude of the iron to be converted into steel, depends more on the quality of the iron ores even than on the preparation of the iron. For instance, the iron procured at Zlataoust, from the ore extracted from the Tesminck mine, is preferred to that of all the other mines in that neighbourhood; and the iron from the iron works of Tagilsk produces steel of a superior quality to that from Zlataoust.

"4th. The steel clippings from the swords made with cemented steel produce cast steel of a quality little superior to that of the clippings of iron.

"5th. The bars of iron which have been buried under ground for some time, produce steel of a quality superior to that obtained from iron which has been recently manufactured. This fact was known in Asia in the most ancient times, but Europeans having forgotten the lessons of their masters in metallurgy, have been in arrear of those nations, not only in the art of making the best steel, but also in the knowledge of the signs by which the perfect article can be positively ascertained. If we are well informed, one English cutler at least, Mr. Weiss, has satisfied himself of the superiority for making steel of iron which has remained a long time under water.

"6th. The clippings of pieces of iron which have been a long time exposed to the air, produce worse steel than fresh iron.

"7th. The steel is of better quality when the pieces of iron are homogeneous and of equal size.

"8th. The steel is softer when the open-

* *Moniteur Industriel*, and *Inventors' Advocate*, No. 90.

ing in the crucible for the proof is small, provided that the pressure of the iron be equal up to the time the lid is put on the crucible.

"9th. If the workman have neglected to put the lid on in time, he may render the steel of good quality by adding as much iron as is necessary to raise the metal to the proper height.

"10th. If at the time of the final proof the steel does not send forth sparks sufficiently bright, the evil indicated by this bad sign may be remedied by introducing through the opening of the crucible two or three pieces of iron of the weight of about half a kilogramme.

"11th. The fusion of the steel mixed with powdered charcoal or soot in determined proportions, and in a closed crucible, as proposed by Messrs. Mushet and Bréan, might, indeed, produce steel, but its degree of hardness would be much less certain than on the plan I have described. In fact, if the charcoal be in excess the steel will become too hard; if there be not enough, the metal will be difficult to fuse, because a part of the charcoal will be volatilised.

"12th. The addition of other metals, such as platinum, silver, or gold, in the proportions of 15 to 12 per cent., somewhat improves the quality of the steel, but the more pure the steel is, the less advantageous do such additions become. The effect of the addition of these metals consists principally in making the steel more easily forged, the proportions of carbon and iron being equal.

"As to brittle metals, their mixture with steel is always more or less injurious, and this becomes more apparent in proportion as the quantity of the alloy is increased."

PROCESS FOR EXTRACTING THE ORE IN LEAD MINES CONTAINING GOLD AND SILVER.*

BY M. BECQUEREL.

The beautiful experiments of M. Becquerel, on the adaptation of electro-chemical† action to effect the separation of lead and silver in galena containing gold and silver, have shown the possibility of applying electricity in the management of these mines. This valuable discovery has indeed been already adopted on a large scale by M. Becquerel, in the experimental manufactory that he has established in Paris; but, as is often the case in inventions of great importance, many years will probably elapse before his system is universally adopted in the working of lead mines containing silver. M. Becquerel observes, in reference to the method of extracting the metal at present pursued:

As a proprietor of the auriferous and argentiferous lead mines in the Duchy of Baden, I have carefully attended to the various processes that are generally adopted, and I am convinced of the possibility of obtaining a much greater produce from the mines by improving this process.

The observations that I have made, may be of some use to the lessees or proprietors of lead mines containing silver or gold. I will mention them in succession, pursuing in detail the method of working in the mines that I have superintended for ten years. Many of these mines are very rich in silver and gold.

First, as the manner of washing the ore. By the manner in which the process is now executed, it is evident that a considerable quantity of the ore is lost, and the portion lost is that which is of the greatest value—the sulphuret of silver.

The gold and silver galenas in general, have for their matrix a very hard quartz, in which are irregularly embedded sulphurets of silver, lead, iron, sulphate of barytes, or carbonate of iron, and also fluor spar. The variety of sulphurets that I have just enumerated contain gold, but in such a state of tenuity, that it is invisible by the microscope, and eludes every attempt to analyse it; yet gold does exist, since it is found in considerable quantity in assaying the silver. The ore broken into pieces of from two to five centimetres, falls by degrees into the trough in which the stampers work. A current of water passes through this trough, which is closed in front by a very close iron grating. The treading of the stampers must be continued for a long time to reduce the ore sufficiently small to admit of its passing through the grating, and being carried into long canals called labyrinths, where it is deposited at a distance further or nearer in proportion to its size.

In attentively examining what takes place during the process of washing, it is remarked that the fragments of ore, owing to the great hardness of the matrix resist the treading of the stampers for a considerable length of time, and that they only very gradually diminish in size till they are completely broken. The ore thus successively reduced into minute pieces, is gradually carried away by the current of water beyond the labyrinth, where it ought to be deposited; and the loss of this part of the ore is more to be regretted, as the sulphuret of silver being very friable, it is the sulphuret that is first carried away; none remains but what is contained in those pieces of the ore, which from their size and weight have had power to resist the influence of the current.

I am well assured that the loss which I have just stated, is but too certain, as at the

* *Moniteur Industriel; and Inventors' Advocate, No.* 89.

† *See The Chemist, No. IX.*

extremity of a labyrinth which reached for 200 metres, I took up water that was impregnated with the deposits of ore. This sediment, on being put to the test, yielded in the same weights a proportion of silver equal to that of the sediment in the water at the entrance of the labyrinth. The particles of gold disseminated in the sulphurets of lead, iron, and silver, not in a state of combination, but only united mechanically, escape in the same way.

Many ingenious men have in their writings indicated as a method of collecting the gold contained in minerals and in auriferous sands, the levigation of these very finely comminuted substances; but I cannot suppose that in this manner they imagine it possible to obtain the whole of the gold; this could only be done by means of chemical analysis. A very simple experiment will suffice to prove how very inefficient levigation is for this purpose.

Take two discs formed of an alloy composed of lead, silver, and gold, and give them a circular motion against the surfaces of each other, by keeping them immersed in a vessel full of water. The water will very soon be rendered turbid and cloudy. If in the same water two discs of the mineral in which the ores are embedded (quartz for instance) are afterwards rubbed against each other, long enough to add new particles to those already contained in the fluid, all the metallic and earthly particles will not be settled till after eight days, and no trace will be perceived on the outer surface of the glass vase that the particles have been deposited according to their specific gravities. They will appear all mingled. Hence it may be concluded that when metals, ores, minerals, and sands, in a state of extreme division are mixed, levigation is an ineffectual means of producing their complete separation.

The next operation to be considered is that of smelting the ores. The products of the mines are also greatly diminished at present by the loss of lead, silver, and gold, in the operation of smelting, in either reverberating or other furnaces generally used.

In the former case the roasting of the slag is a long and difficult operation, and with many ores almost impossible; those of Baden for instance, of which the matrix composed of quartz, of sulphate of barytes, and of fluor spar, is fusible to such a degree, that in making use of the reverberating furnace it would be necessary to smelt without previously roasting, and to let the first melting run out, which it would be necessary afterwards to calcine before resmelting in another furnace, which must also be resorted to, to extract part of the refractory scoriæ. The losses in smelting are occasioned—

1st. By the volatilisation of a great quantity of sulphuret of lead and sulphuret of silver, before their reduction.

2d. By the action of the fluxes, and particularly the silex on the lead at its different degrees of oxydation, from whence is produced the siliciurets of lead which unite with the scoriæ.

3d. By the alkaline sulphurets and persulphurets, which, in a great degree absorb the gold contained in the ore to be smelted.

4th. By the great quantity of fuel necessary to be used to retain in a state of constant fluidity the enormous proportion of the scoriæ of forges and furnaces obliged to be added to the melted ore, in order to secure the metal from being reduced by oxydation and volatilisation during the time it is passing into and remaining in the furnace, where I believe the temperature is raised to a much higher degree than is necessary.

5th. Finally, because, instead of obtaining by one smelting in which there is so great a consumption of combustible, the whole of the lead contained in the ore, only half of it is at first extracted, and the other half must be afterwards calcined, which is only an impure metal or sulphuret, in order to be smelted again.

I make no observation on the manner in which the operation of cupelling it is done at Baden, because I believe it is impossible to be managed better.

The consequence of the inconveniences that I have enumerated is, that though the produce arising from the gold and silver lead mine is quite equal to what might be expected in their present condition, it is yet capable of being considerably increased by improving the method of washing and smelting. I am in possession of the certain method of effecting this, whith I shall allude to in another paper.—*Moniteur Industriel.*

III. PHARMACY, &c.

REPORT OF THE COMMITTEE APPOINTED AT A PUBLIC MEETING OF CHEMISTS AND DRUGGISTS, HELD AT THE CROWN AND ANCHOR TAVERN, STRAND, ON THE 15th OF FEBRUARY LAST.

Your Committee, immediately upon their appointment, opened a communication with the Chemists and Druggists of every town in England, and of some towns in Ireland and Scotland, requesting the co-operation of the members of the trade, and soliciting subscriptions to enable them to offer the most powerful and effectual opposition to

Mr. Hawes's Bill; and your Committee had the satisfaction of receiving, not only promises of support, but liberal subscriptions from many places.

Agreeably with the instructions of the General Meeting, your Committee proceeded to the appointment of a deputation, for the purpose of conferring with Mr. Hawes, on the subject of postponing the Second Reading of his Bill; to which request Mr. Hawes readily acceded, and also undertook to erase from the said Bill every clause having special reference to the Chemists and Druggists.

Upon the introduction of Mr. Hawes's second Bill, your Committee, acting under the advice of their Counsel and Solicitor, determined to offer it their most powerful opposition, as the provisions of the latter Bill had an injurious power over the interests of the Chemists and Druggists equal with that of the former.

Your Committee, through their Solicitor, thereupon required of Mr. Hawes that he should insert a protective and explanatory clause, which should render the Bill totally inoperative upon the interests of Chemists and Druggists. To this Mr. Hawes has assented; and should the Bill pass a Second Reading the said clause will be duly inserted.

Your Committee, however, are bound by parliamentary usage to offer an opposition to the Second Reading of the Bill, and they have caused a Petition to be presented to the House of Commons against the measure.

They have also sent a copy of the same to almost every town in England, requiring the members of the trade, in the various localities, to forward a Petition, on their own parts, against the Bill, and to instruct their representatives in the same opposition. Your Committee had the satisfaction of finding that, upon a Second Reading of the Bill being attempted, a large number of Petitions were presented against it, and the House was "counted out." Your Committee, though warranted in expressing an opinion that this Bill will not pass, are yet aware of the undiminished necessity of watching any further attempts to accomplish that object.

In the progress of their proceedings, your Committee ascertained that the College of Physicians, the College of Surgeons, and the Apothecaries' Company had conjointly proposed obtaining some legislative enactment, by which the Chemists and Druggists were to be, for the future, placed under the government and control of these learned bodies, more especially of the Society of Apothecaries.

A Deputation from your Committee, therefore, sought and obtained an interview with the College of Physicians and the College of Surgeons, respectively, and received from the former an official notification that it was their intention to introduce into their proposed measures of medical reform, a provision by which the Chemists and Druggists should thenceforth be placed under some legislative control; and your Committee have, therefore, again assembled you for the purpose of receiving new instructions and enlarged powers to meet present and future circumstances.

Your Committee having considered the subject, are of opinion that the Chemists and Druggists are capable of self-government; they, therefore, recommend that the Chemists and Druggists of the Empire should immediately form themselves into a permanent Association, to be denominated the "PHARMACEUTICAL SOCIETY OF GREAT BRITAIN," having for its object the union of the members of the trade into one body—the protection of the general interests—and the improvement and advancement of scientific knowledge. As the basis of such union, your Committee would recommend the adoption of Education, Examination, Registration, and Representation as involving beneficial results to the Public in general, and to the Chemists and Druggists in particular; and offering to the existing medical corporations, and to the medical profession at large, a guarantee, that whilst the Chemists and Druggists are anxious to retain their present privileges, they are disposed to afford every public evidence of their fitness to exercise them.

JOSEPH GIFFORD, Chairman.

At a Public Meeting of the Members of the Trade, held at the Crown and Anchor Tavern, in the Strand, on Thursday, April 15th inst., R. H. Pigeon, Esq., in the Chair, the foregoing Report having been read, it was

Moved by Mr. Payne, seconded by Mr. Wilkinson, and

Resolved, That this Report be received, and the best thanks of this Meeting be given to the Committee for their past exertions.

Moved by Mr. Dinneford, seconded by Mr. Hudson, and

Resolved, That the Report be printed, and be circulated at the discretion of the Committee.

Moved by William Allen, F.R.S., seconded by John Bell, and

Resolved, That for the purpose of protecting the permanent interests, and increasing the respectability of Chemists and Druggists, an Association be now formed under the title of the "PHARMACEUTICAL SOCIETY OF GREAT BRITAIN."

Moved by Mr. Morson, seconded by Mr. Davy, and

Resolved, That the present Committee be requested to frame Laws and Regulations for the government of the Society, to be laid before the next meeting of the Members for confirmation and adoption.

Moved by Mr. Savory, seconded by Mr. Gifford, and

Resolved, That the Thanks of this Meeting be given to Richard Hotham Pigeon, Esq., for the able and satisfactory performance of the duties of Chairman; and also for having afforded every accommodation to the Committee in their meetings at his house in Throgmorton Street.

List of Committee.

Allen, William, F.R.S., Plough Court.
Alsop, Robert, 15, Sloane Square, Chelsea.
Barron, Charles, 6, Giltspur Street.
Barry, John T., Plough Court.
Battley, Richard, 32; Lower Whitecross Street.
Baxter, George, 114, High Holborn.
Bell, Jacob, 338, Oxford Street.
Brigg, Edwin, 48, Wigmore Street.
Butler, Thomas, 4, Cheapside.
Davy, Charles, 100, Upper Thames Street.
De Castro, Samuel, 25, Great St. George's Place, Knightsbridge.
Dinneford, Charles, 172, New Bond Street.
Ellis, John, 225, Upper Thames Street.
Farmar, Robert A., 40, Westminster Road.
Foulger, Samuel, 133, Ratcliffe Highway.
Gifford, Joseph, 104, Strand.
Green, Samuel, 1, Harleyford Place, Kennington.
Hanbury, Daniel, Plough Court.
Herring, Thomas, 40, Aldersgate Street.
Horner, Edward, 20, Bucklersbury.
Hudson, William B., 27, Haymarket.
Ince, William, 31, Southampton Street, Covent Garden.
Keating, Thomas, 79, St. Paul's Churchyard.
Descher, J. S., 4, Cripplegate Buildings.
Lowe, William, 47, Blackfriars' Road.
Mayhew, Samuel M., Camberwell Green.
Morson, Thomas, 19, Southampton Row.
Payne, Charles James, 5, St. Martin's Court.
Pigeon, Richard Hotham, 31, Throgmorton Street.
Pound, Matthew, 198, Oxford Street.
Savory, John, 143, Bond Street.
Simkin, Edward, 2, New Cavendish Street, Portland Place.
Smith, Joseph, 29, Haymarket.
Smith, George W., 125, Lower Thames St.
Squire, Peter, 277, Oxford Street.
Stamper, Ralph, 140, Leadenhall Street.
Toller, John, 18, Conduit Street.
Walker, Thomas, 48, Tooley Street.
Waugh, George, 177, Regent Street.
Winstanley, Edward, 7, Poultry.

The following is the circular accompanying the copy of the Report, which the Secretaries have been sending round to the trade:—

"Sir,—We forward for your information, the Report of the Second Meeting of the London Chemists and Druggists, and hope that their proceedings will obtain your approval.

"The Committee trust that the importance of union at the present time, and the advantages which must result from its continuance, will induce Chemists and Druggists in all parts of the kingdom to become members of this Society.

"The Committee will thank you to forward, as early as convenient, and in as complete a manner as possible, a list of all the Chemists and Druggists of your neighbourhood, as a means of facilitating our future communications with them.

"We have the honour to remain,
"Your obedient servants,
R. A. Farmar,
Geo. W. Smith,
Secretaries.

The above Report will prove highly gratifying to our readers, and to every well-wisher of that most important class—the Chemists and Druggists—and, more particularly, that part of it which announces the formation of a Society, having for its objects "the protection of their rights and interests, and their improvement and advancement in scientific attainments," under the designation of a title which we think extremely well chosen—The Pharmaceutical Society of Great Britain."

Every resolution which was carried at the meeting commands our most cordial concurrence, and we feel happy that our observations have been, from time to time, without any deviations, such as are now the standing rules of the committee. Had they submitted themselves to be under the government of either College, and particularly under that of the Society of Apothecaries, they would have degraded themselves, and lost sight of their own interests past all redemption. They have, however, declared themselves to be totally distinct from, and independent of, any of these, to whom they have set a noble example to "go and do likewise"—an example which will serve the interests and honor of these

bodies better than any acts of the legislature, unless they be made to enforce complete education, and such examinations as are calculated to prove the qualifications of their members—not a mere show and mockery. That the establishment of an association on such principles as those of the PHARMACEUTICAL SOCIETY is the very best for all parties interested, must be evident, inasmuch as its chief objects are to ensure the education of its members. This will enable them the better to guard their own rights and interests against any aggressions or encroachments—will defy the calumny and malignity of interested parties, and will give security to the public of their qualifications to practise their calling, not only without danger, but with great benefit. The foundation of this society we hail as a great measure, and are confident that it will be the commencement of an improvement in medical practice much greater than can be produced by any bills in Parliament. In relation to the poor, very considerable advantage will be obtained, by the better education of chemists, inasmuch as they will be able to get relief in trifling cases and under sudden emergency, for as many pence as they would have to pay shillings to the apothecary.

Infinite credit is due to the Committee, to whom the whole body of the trade is indebted in a very onerous debt of gratitude, for their manly and persevering struggles, (which have nearly cost one of its chief and most worthy members his health,*) to preserve the trade from utter destruction. We trust and believe that every respectable chemist and druggist will not only join the society himself, but make it imperative on his pupils and apprentices so to do. Nay, we may add, that to co-operate with it will greatly enhance the respectability of its members.

We can now foresee the removal of all difficulties in the way of medical reform, and we advise the disciples of Esculapius to begin in precisely the same way as the chemists have done, and their title to respect will be better secured than by aiming at distinctions not based upon merit.

The numerous schemes of medical reform which have been put before us are by far too chimerical to deserve notice. We see in *The Times* the suggestion of a person to separate the dispensing from the professional part; in this suggestion we had anticipated the gentleman a long time, but we are now quite satisfied of its total impracticability, and therefore have desisted from any further observations upon it.

In concluding our remarks for the present, most urgently do we advise the junior part of our readers, who are engaged in pharmaceutical pursuits, to obtain a more perfect knowledge of those branches of science connected with their business, and not to treat the study of chemistry and other sciences as a mere dry task, as we fear is too often the case. No doubt they are aware that science is dry and uninteresting only to the ignorant, and therefore we do hope they will have more ambition than to be classed with such, and that the admirable course adopted for their benefit by the higher ranks in their profession will not be thrown away upon them. It is quite clear that it is not only conducive to their improvement in science, but likewise to their success and interests in business, that they pay proper attention to such studies as are connected with their calling. If they neglect them, they will find that ignorance is productive of numerous inconveniences and disadvantages; but on the contrary, that a due acquisition of them will prove to them the truth of the observation of Lord Bacon, that

"KNOWLEDGE IS POWER."

* MR. BARRY.

MEDICAL REFORM,—MEETING OF CHEMISTS AT NEWCASTLE-ON-TYNE.

To the Editors of The Chemist.

26, Grey Street, Newcastle-on-Tyne, 23d April, 1841.

GENTLEMEN,

Agreeably with a resolution below, I beg to hand you a copy of proceedings, and to request the favor of insertion in your valuable Magazine, if you deem proper.

Yours faithfully,
G. WILSON CHALLONER.
Hon. Secretary.

At a numerous and respectable public

meeting of Chemists and Druggists, convened by circular, and held at the George Inn in Newcastle-on-Tyne, on Friday 23d of April, 1841, for the purpose of taking into consideration the propriety of addressing the London Association, on the subject of compelling Chemists and Druggists (hereafter commencing business) to undergo examinations, and imposing licenses on all persons selling drugs, in order that the retail trade may be kept in its proper channel:

Mr. Proctor in the Chair.

It was moved by Mr. Bustin and seconded by Mr. Gibson, and—

Resolved, That the trade of a Retail Chemist and Druggest involves many and great responsibilities deeply affecting the interests of the public. It is therefore the opinion of this meeting that much benefit would result to all parties if a regular examination and qualification were compulsory on all persons prior to commencing this business.

Moved by Mr. Gibson and seconded by Mr. T. Ridley, and—

Resolved, That this meeting cordially adopts the principle of a licence being imposed on all persons selling drugs.

Moved by Mr. Garbutt and seconded by Mr. H. Gibson, and—

Resolved, That Mr. Edward Wilson Challoner be requested to forward copies of these proceedings to R. Pigeon, Esq., and to the Editors of *The Chemist*, recommending steps to be taken for the accomplishment of this most desirable object.

Moved by Mr. E. Wilson Challoner and seconded by Mr. Smith, and—

Resolved, That the cordial thanks of this meeting be given to the "London Committee," and also to the "Editors of *The Chemist*," for their attention to the interests of the trade.

Signed on behalf of the meeting,
W. Proctor, Chairman.

Mr. Proctor having left the chair, the thanks of the meeting were unanimously voted to him for his able and impartial conduct.

MEDICAL REFORM AS AFFECTS DRUGGISTS.

LETTER II.

To the Editors of The Chemist.

Gentlemen,—The thanks of the Chemists and Druggists must, I think, be awarded to Messrs. Hawes, Wakley, Warburton, and Co. But for those gentlemen we had never heard of any stir among the plodding servants of Esculapius. The latter, it is true, have long borne a heavy and a drudging burden,* but I doubt if any thing would have incited them to activity and resistance had they not been goaded on to it by oppression, still more oppressively overbearing. Mr. Hawes perhaps has greater claims than any upon the gratitude of chemists and druggists, because his wish was to place their rights and privileges under the "protection" of the legislature. In the same manner, I may say the liberties of the poor of this country have been placed under the "protection" of the government. We live in the very age of liberal-mindedness; and yet there are many curious occurrences that ought not to pass by without remark,—some indeed that cannot without awakening our amazement.

It was not, Gentlemen, until liberals had laid down the law, that poverty was to be considered a crime punishable with bonds and imprisonment; nor was it supposed till declared by liberals, that to administer relief to the sick, to ease the smart of pain, to soothe the anguish of disease, were crimes to be visited with a sure and speedy punishment by the hand of the law.

"Thousands of people" says *The Lancet*, "are annually destroyed by the prescribing druggists, quacks, and other impostors." This, if a grave assertion of that veracious journal, must no doubt be the fact. But it has not yet been asked how many hundreds of those thousands would otherwise have been brought to a speedy death in union workhouses,† driven there by doctors' bills passing through the courts of requests. Either a gracious Providence must be pleased to withdraw disease entirely from the house of the destitute, or the care of his beloved poor must henceforth be left to the mercies of the "doctors,"—

——"Men of nicest honour and fine sense.
Yet wanting sensibility!"

or consigned to those whited sepulchres fitly called "union" workhouses, as implying an union of life with the grave.

Many blessings upon our old British constitution: it is considered that if Mr. Hawes had been able to carry his oppressive clauses into a law, it would also have carried with them a most flagrant violation of the liberty

* It will be found by calculation that retail chemists are engaged in business during a time every week not less than 9 mechanics' days; being 6 + 3 = 9, or *one-half* of time *more* than the commonest mechanic.

† Mr. Wakley is now labouring to show that, of all things in the world, union workhouses are the largest contributors to the bills of mortality.

of the subject. In spite of all this we shall find that no effort will even now be left untried that either cunning can suggest, or hardihood venture upon. Verily, the medical reformers are attempting too much. They began by setting right and justice at defiance; they rushed headlong to the work. Heaven and earth were to be moved to procreate medical reform. What is the result? *Parturiunt montes!*—but it will turn out to be a mere case of abortion.

A very sensible writer in the *Quarterly Review** says, that though it is just that none but qualified practitioners should be appointed in all cases where the public have to provide medical relief for their fellow-creatures, yet that "each individual in society, with respect to his own complaints, *has a right to consult whom he pleases.*" I might add, too, that when the legislature shall establish the principle of concerning itself about the health of individuals *as such*, there is no reason why many other matters that relate thereto should not be brought under legislative care. Why, for example, should not laundry-women be liable to fine or imprisonment for sending home damp linen? But the grand 'saving clause' in all such attempts at legislation for individuals is—absurdity.

To take a different view of the subject, I shall suppose that the general practitioners could obtain all they fancy they should like, would they not soon be glad to return to the old system? The anxiety, uncertainty, and responsibility that attends upon the treatment of serious disease already bears down their health and strength, and sends them to the grave earlier than other men. Would this harass and toil be diminished if all the druggists could be banished from the land? One man perhaps has cut his finger and wants it dressed immediately; another must be made a tooth or more minus, instanter; a third has scalded his largest toe, and must needs have it inspected. Graver matters all the while are calling the good man away, and these perchance to be interlarded with toothaches, headaches, heartaches, and bellyaches. O that the medical millenium might arrive! I could not desire a severer retribution upon the knavery and avarice of medical reformers, than for the petty distractions of the chemist and druggist to be mingled with the toil and anxiety of the general practitioner.

But how stand the future prospects of the chemists and druggists? Novices at present in all matters of cordiality for one another, they have yet to experience the noble advantages of association. The application of the homely fable of the bundle of sticks is a sealed mystery to them, or nearly so. They have hitherto been used to think that the interests of individuals can only be promoted by the tortuous purposes of *self*. Competition and depreciation (whether of drugs or druggists) have been the only process, in many instances, through which they have proposed to get rich. But a new light is dawning upon them; they are now rubbing their eyes and beginning to see what a mass of *crugo* a grovelling spirit has coated upon them. Agreed upon the general expediency of association, they are even showing some small signs of public spirit. This, however, is not sufficient. They must thoroughly arouse themselves to the business—shake off the gross lethargy of selfishness, and combine, like other parts of the rational creation, to form such a powerful body as may benefit every individual.

The new society, to be called the 'Pharmaceutical Society of Great Britain,' has been projected at a most appropriate time, and under the most favourable auspices. Present space does not admit of detail, but I must say that the men who are concerned in organizing that Institution, afford the strongest guarantee to all parties, of its thorough completeness and efficiency. Nor will it be wanting in respectability either, as long as men so venerable and distinguished as William Allen, with the other gentlemen of the committee, are to be numbered among its members. What inducement do the druggists want more? I conclude they will not require to be forced into an institution that has been formed for the protection of their interests. Let me give them this one small caution, it may not be long before their interests will otherwise be forced from them.

I remain, Gentlemen,
Your obedient Servant,
W. G.

* Dec. 1840, p. 57.

HOMŒOPATHY.—ANSWER TO MR. P. H. HARPER.

BY MR. YOUNG.

In the articles which appeared in *The Chemist* on the subject of Homœopathy, I endeavoured to give a rough sketch of the leading differences between that system and the science of medicine as practised by Allopathists: I had intended to have given afterwards a few of the leading principles with which all persons who intend to give Homœopathy a trial ought to be acquainted; but as Mr. P. H. Harper has published a "Refutation of the Homœopathic Doctrine of Hahnemann," I think it imperative on me to notice Mr. Harper's notable effusion, before proceeding further, merely remarking that it is hardly fair to endeavour to refute

that which was written merely to convey to others an outline of a science but little known, and which, consequently, was not composed for the purpose of discussion; but nevertheless I shall not shrink from the encounter. I will take Mr. Harper's arguments (query, assertions?) in the order in which he has arranged them. In the first place, we learn that Brownism is the mother of Homœopathy, and that had it not been for Brownism, Homœopathy would "never have extended beyond the sphere of Hahnemann's own circle." For my part I am at a loss to conceive who or what this venerable personage or system may be which has given birth to the monster Homœopathy. Mr. H. is truly and indeed an Allopathist, not content with attributing to every disease a material cause, he must needs find a cause for Homœopathy.

"The absurd doctrines which it sets forth would never have found place, except among persons incapable of thinking for themselves." Indeed—can this be true? Is it possible that Bigelius, Rau, Stegman, Hufeland, the accomplished Quin, and the enlightened Dunsford, are men who cannot think for themselves? Is it possible that Stratten, Currie, Epps, and upwards of 300 gentlemen who write M.D. after their names, are incapable of judging for themselves!—Oh, Mr. Harper!!

Mr. H. goes on to say, that "All that Hahnemann ever said or published amounts only to assertions." Has Mr. Harper ever seen or read the "Materia Medica Pura?" If he has not, he knows nothing of the science taught by Hahnemann, and ought not to write a word on the subject; if he has both seen and read it, what is his definition of the word assertion! He sees before him two thick 8vo. volumes, filled with an account of the effects of different medicines, on individuals otherwise in health, their effects accurately noted, the duration of those effects, both primitive and secondary, is also put down with fidelity: yet these experiments are called "assertions!" Oh, Mr. Harper!!

"They (the Homœopathists) regard only the particular pains and debilities of which the varieties of sickness are composed. The proximate causes are likewise overlooked, though the remote causes are more studied." It is true, they *do* regard those particular pains, &c. of which sickness is composed in acute diseases,* and if they remove those symptoms, and restore the patient to health, what more is required? But surely Mr. Harper does not think it a crime for any healer to study the remote cause more than the proximate. How is the disease to be cured by removing the proximate, when the remote cause still operates upon the system?

I beg leave to assure my opponent that the proximate causes of disease can seldom be mistaken, and that Homœopathists do not refer them to "dynamic power," but to derangement of that power." Because all, or most diseases are attended with more or less derangement in the circulation. "I suppose," says Mr. Harper, "that Hahnemann would always lay the cause there." This is a decided case of the pot calling the kettle black, for it is "the very error," the deadliest error the Allopathists are guilty of; and proceeds Mr. H., "let us for a moment, suppose it is so—I cannot myself allow such a thing,—no not even for an instant." It is perfectly clear to me that Mr. H. knows nothing whatever of the first principles of the doctrine of Hahnemann.

Mr. Harper next proceeds to ridicule the Homœopathic doses, quoting extreme cases, and answering for the Homœopathists, as to their remedies and doses; but calculations about the area of the great pyramid, &c. &c. will not serve instead of arguments. If these doses are so inert, how was it that Dr. Uwins, one of the most celebrated physicians, cured typhus and other fevers Homœopathically, as testified in a pamphlet, wherein he published several cases just before his death.†

But how the supposed cases refute the fact of the Pathogenetic effect of medicines on the healthy subject, I am at a loss to conceive. Does Mr. Harper mean to say that medicines do not produce disease when taken internally? This would be carrying the assertion rather too far; because, if true, arsenic, copper, mercury, belladonna, &c. &c., might be swallowed with impunity. Does not mercury, when taken by an healthy individual, produce salivation, &c.? An Allopathist has lately taken the trouble to write a book, wherein he proves that the affections usually called "secondary symptoms" are produced by the use of mercury, or rather by the abuse of that remedy.

Mr. Harper asks—"Why does it (Homœopathy) not act as it ought to do, if there were any truth in it, with as much certainty in apoplexy or pneumonia as it does in the safe-ground the Homœopathists occupy, of the chronic diseases of the nervous system, in hysteria, and in all the varied forms and hydra-headed kinds of dyspepsia,

* In the papers which previously appeared in *The Chemist*, no mention was made of Hahnemann's division of diseases into chronic and acute, as I thought it better to defer that part of the subject until I came to treat of the Practice of Homœopathy.

† Homœopathy *versus* Allopathy, by Dr. Uwins.

in which the merest tyro knows that oftentimes imagination acts with far more power than the most potent drugs?" "Allopathically applied" should have been added to the sentence, and it would have been perfectly correct: but I would only ask why (if these diseases are to be cured by acting upon the imagination) physicians dose their patients in such cases with their filthy compounds, and give purgatives until the bowels will not act without them. Why do not they content themselves with curing by acting upon the imagination of their patients, and spare them the misery of swallowing medicine after medicine, until death puts an end to both physic and fee-taking? "Aye, there's the rub!" It surely is not possible to act upon the imagination of infants, and yet the Homœopathic medicines act with more certainty and facility with them than in any other class of patients. I have also seen patients who have been treated Homœopathically, and yet knew no more of it than Mr. P. H. Harper; or, to speak more plainly, knew nothing of the science, and yet were cured.

With regard to the "18 or 20 patients weekly," who presented themselves with the symptoms described by Mr. H., did that gentleman take the trouble to inquire whether they were engaged in any occupation or employment where mercury was used in any shape or way—if not, he has given to the world a description of a disease hitherto unknown, and therefore not a case in point.

The increase of power is also denied to medicines after trituration. "Supposing electricity to be developed during the trituration, how is it retained in the molecules of the medicines, when, as is well known, that electricity however developed, has an overwhelming tendency to discharge itself through the surrounding objects?" I answer, that supposing it to be electricity (mind, I do not say that it is), it is confined in the globules in the most easy manner possible, by keeping them in perfectly closed glass vessels, and any one who has seen Homœopathic medicines, knows full well that it is invariably done.

"Dr. Muret, of Morges, wishing to determine the effect of trituration on a medicinal substance, tried the following experiment:—

"Having procured two rabbits of the same age and strength, he gave to one a grain of hydrochlorate of barytes, which had been pounded and rubbed for an hour. The animal almost immediately fell down, was violently convulsed, and sunk into a moribund state. To the second, the same quantity was given without having been submitted to any manipulation, and the animal was very slightly affected by it, merely losing, for a short time, power over the hind legs, and that not until the medicine had been taken nearly half an hour. In order to prevent the possibility of error, the experiment was reversed, and the effect was precisely the same."*

"They will perhaps be so good as to shew us the exact seat of disease in fever, hydrophobia, &c." Now, homœopathists direct their medicines to the exact seat of the symptoms, surely not to the seat of disease itself, which they do not profess to know, (except in chronic diseases),—they therefore direct their remedies to the principal symptoms, but they do not call those symptoms, as the allopathists do, the cause of the disease: such and such a disease, say the allopathists, is caused by disease of the mucous membrane of the stomach, forgetting in all the pride of their boasted diagnosis, that a deviation from the normal state in the mucous membrane, must have a cause, and therefore is only a symptom. "Tolle causam," "tolle causam," continually they cry.—GOD help their patients!

"But the homœopathists may say—'Well, we succeed in curing our patients: how is that, if our doctrine be so absurd?' granted: but how do they succeed? first, by inspiring great confidence in their remedy." Mr. Harper grants the Homœopathists can cure their patients: no reasonable man can wish for a more sweeping concession than that; the only wonder is, that Mr. H. took the trouble to write against a science which he admits does all that can be required of it; why not at once embrace Homœopathy? for I fearlessly assert, that allopathists CANNOT cure their patients.

The next observation of Mr. Harper's, is a beautiful instance of the discriminating powers of a lady who did not known fulminating balls from homœopathic globules: really this must have been rather a strange mistake, seeing that fulminating balls (at least all I have seen) are the size of a field-bean, and homœopathic globules no larger than millet seed; and, moreover, are never by any chance put into boxes, not to say any thing about the coincidence of the two boxes being alike; really this is too absurd. Instead of patients having great confidence in Homœopathy, they generally are very incredulous as to the result of the treatment, but once treated after this method, there is no danger of their return to the bleeding, blistering, and purging system. Diet, in Homœopathic practice, is rather severe in some, no doubt, and is a means of enabling the physician to cure with much less doses, thereby avoiding reaction and aggravation of the malady, yet it lasts only while the medicine continues to be taken. But the

* Dunsford's Practical Advantages of Homœopathy.

diet of the allopathists is generally a palliative remedy, and when other means fail, they lay down rules of diet for the term of a man's natural life: there is a wide difference between the two, I calculate.

"A well directed pause often hastens, and almost perfects a cure." I can easily imagine that when a patient is being bled, blistered, leeched, and purged, and all this by no sparing hand, that a PAUSE will most certainly hasten the cure, and I am inclined to think, that if these PAUSES were more frequently taken advantage of, many and manifold would be the benefits conferred by allopathists upon their suffering patients.

"Homœopathy has, and undoubtedly will have, numerous proselytes," observes Mr. Harper. I am happy to say that it has, and where five years ago there was one convert, five hundred will now be found. The science is steadily increasing; there are now three dispensaries where the poor may avail themselves of its benefits; any one who will take the trouble to read the "Annals of the Homœopathic Dispensary," by Dr. Currie, will find those benefits are no slight cause of the progress this science is making.

As a concluding proof that the minuteness of the dose does not alter the good effect of the remedy, I will take the liberty to give one case out of many published by H. Dunsford, M.D.

"A young lady, aged ten, was seized about two years ago, with inflammation of the tonsils, which rapidly increased so as to occasion a dread of suffocation. On examining the throat, I found the tonsils enormously swelled, so as almost to touch one another. The little patient was compelled to sit up in bed with her mouth open and the tongue protruded; the eyes were suffused, as if starting from their sockets, the pulse one hundred and thirty. I was apprehensive that in this stage of the disease nothing would arrest its course, and feeling that the least increase in the size of the inflamed tonsils would instantly produce a fatal result, I prepared for the operation of puncturing them. In the mean time a dose of aconitum was administered, and soon afterwards belladonna in solution. The effect exceeded my expectations; the fever became less, the swelling of the tonsils gradually subsided, and without suppuration the parts returned to a normal state. Thus a disease which threatened the existence of the patient, was overcome in the course of forty-eight hours. Carbo veget., and other antisporic medicines were afterwards administered, and the result has been, that although previously very liable to such attacks, she has remained free from them ever since."*

Lastly, I beg to record my conviction, "that eventually people's eyes will be opened" to the truth and manifold advantages of the system taught by Hahnemann; and let its doctrines be ever so full "of absurd and untenable dogmas," still, by Mr. Harper's own confession, IT CURES DISEASE. What more can be wished for by a patient?

EXPERIMENT ON POISONING BY ARSENIC: MADE BEFORE THE ROYAL ACADEMY OF MEDICINE, PARIS.

BY M. ORFILA.

(*Continued from No. XV.*)

THIRD SITTING; NOVEMBER 1, 1840.

The sitting commenced at two o'clock. M. Orfila announced that on Wednesday, the 28th of October, at ten o'clock in the morning, he had made four experiments before MM. Husson, Amussat, Ollivier (d'Augers), Soubeiran and Caventou, members of the Commission, with the view of proving that dogs poisoned by solid arsenious acid or stibial tartar, applied to the sub-cutaneous cellular tissue of the thigh, died in the space of from twenty to forty hours, if they are left to themselves and do not pass urine; whilst they were cured if made to do so in considerable quantities, by means of aqueous or diuretic drinks.

Next day, the 29th, at ten in the morning, one of the dogs poisoned by arsenious acid, to which no drink had been given, and which had not once made water, was dead. The other dog submitted to the action of arsenious acid, had been treated by diuretics, and did not seem to be perceptibly affected. One of the dogs poisoned by emetic was in a desperate state, although the diuretic drink had been three times administered to him; but he had not once made water. The other dog poisoned by emetic was tolerably well; but he had made water twice during the night, and continued to do so abundantly: the secretion was favored by letting him drink water.

The same day, the œsophagus of two little dogs was detached and tied; the ligature was maintained until the 30th, at ten in the morning. The dog poisoned by emetic, which had not made water, died during the

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* "Dunsford's Practical Advantages of Homœopathy,"—a work well worth the trouble of reading by those who wish to know the effects of Homœopathic practice.

night of the 29th. The other two dogs had almost recovered.

At the opening of the sitting, M. Orfila showed the four dogs cured, namely, the two whose œsophagus had been tied on the 29th, and the two which had been poisoned on the 28th, by ten centigrammes of arsenious acid and emetic. The liver and urine of these animals were left for examination until the next day.

At twenty minutes past ten, twenty-five centigrammes of arsenious acid, dissolved in a hundred and thirty grammes of water, were administered to a very healthy moderate-sized dog, and the œsophagus was tied. At two o'clock the animal was dead.

At twenty minutes to eleven, the same dose of poison, also dissolved in 130 grammes of water, was administered to two small dogs, which were allowed to vomit; these animals will have warm water administered to them, and will be cured if they vomit a few minutes after swallowing the poisonous substance.

Fifty centigrammes of finely powdered arsenious acid were administered to two dogs; warm water was given to them. These dogs will be bled three hours after the commencement of the experiment, and will be cured if they have vomited. One of these dogs was poisoned at a quarter past eleven, and the other at twenty-five minutes past. At two minutes past eleven, a gramme of the same poison was administered in the solid form to a little dog: the animal took only some warm water, and will be cured, if he vomits sufficiently.

One hundred and twenty-eight grammes of broth, sixty-four grammes of wine, and as much brandy were injected into the stomach of a moderate-sized dog. This injection will be repeated at half past one and at a quarter past four. The animal will perish in twenty-four hours, although not prevented from vomiting.

The desiccation of a putrid human liver was then proceeded with, after having been cut into small pieces. The dried product was carbonised, in a porcelain capsule, by eight hundred grammes of concentrated nitric acid; this carbonisation proceeded slowly and with difficulty; nevertheless, a very dry carbon was obtained. The latter was boiled for twenty-five minutes in distilled water. The filtered solution, which was of a blackish color, introduced into a Marsh's apparatus, previously tested, did not yield arsenic. Only five or six opaque white stains were obtained, in which none of the characters of arsenical stains were observed; after twenty minutes' trial a drop of a concentrated solution of arsenious acid was put in, and almost instantly brilliant arsenical stains were deposited.

To ascertain whether the alcoholate of potassa, which we are frequently obliged to use in medico-legal investigations, contains arsenic, sixty grammes were dissolved in distilled water: the liquor was saturated with pure sulphuric acid, and the sulphate of potassa was introduced into a previously tested apparatus: no arsenical stain was obtained, even after half an hour. On the addition of a drop of a concentrated solution of arsenious acid, a considerable number of arsenical stains were immediately obtained.

If it should happen that an individual, poisoned by arsenious acid, was treated by stibial tartar and died, it might occur that in the medico-legal investigations, to which the body would be subjected, both arsenical and antimonial stains would be obtained; it is important, therefore, to draw attention to this point. The arsenico-antimonial stains vary in appearance according to the proportions of arsenic and antimony that they contain. When the former predominates, they are of a light brown color in certain points and bluish in others: if the antimony is most abundant, they are of a deep blue, although here and there the brown tint of arsenic may be perceived: both, if they are very thick, are of a very deep color, and not very brilliant. On some of these stains being submitted to the action of a flame of pure hydrogen, the arsenic was instantly volatilised, and the stain, then reduced to a simple antimonial one, presented the blue or grey color of the latter; it was extended by the action of the flame, and acted in all respects as a pure antimonial stain. But the best means of attesting this mixture consists in dissolving these mixed stains in pure concentrated nitric acid; in evaporating the mixture to dryness; in treating the yellow residue thus obtained by boiling water, which dissolves the arsenic acid in a few minutes, and leaves the yellowish antimonious acid; it is left to settle, and is decanted; the solution of arsenic acid being evaporated to dryness, gives a residue which nitrate of silver immediately converts into brick red arseniate of silver. The antimonious acid may be instantly detected by dissolving the yellowish residue above mentioned, in a few drops of pure boiling hydrochloric acid: on this solution being diluted with a little water, and on a few bubbles of hydrosulphuric acid being driven into it, an orange colored precipitate of sulphuret of antimony is immediately obtained. This operation, made before the sitting, furnished the indicated results.

The stains of sulphur are yellow, dull, and insoluble in nitric acid. The stains of iron are brown, dull or shining, fixed, and instantly dissolved in hydro-chloric acid, with which they form a yellow chloride, which, being evaporated to dryness, turns blue with

the ferro-cyanuret of potassium, and presents all the characteristics of salts of that metal. After having announced that there has been found in shops, hydrated peroxide of iron containing arsenic, probably in the state of arseniate, and that this metal also exists in colcothar, in certain sulphates of iron of commerce, and in certain carbonates of iron, M. Orfila boiled for an hour and a half four ounces of arsenical colcothar (dry peroxide of iron) with pure sulphuric acid, diluted with a third of its weight of distilled water; the liquor, to which was added a little water as it evaporated, was afterwards filtered and introduced into a Marsh's apparatus, previously tested; there was immediately deposited on the capsule several large and fine arsenical stains; these stains are always mixed with iron.

The same dose of colcothar exhausted with boiling distilled water, or with water mixed with two grammes of alcoholate of potasse, yielded liquors from which no traces of arsenic were obtained by means of Marsh's apparatus.

With regard to the soils of certain cemeteries, M. Orfila is of opinion:—

1st. That there exists very small portions of arsenic in some of them:

2d. That this arsenic cannot leave the earth to enter into the organs of a body buried in it, because it is in the state of a salt which is insoluble in boiling water; because, to detect it, the prolonged action of an energetic agent—boiling concentrated sulphuric acid—is required; and because the skin only very difficultly allows poisonous solutions to penetrate it, even when the body is steeped in a bath composed of those solutions:

3d. That it may happen that the body of a poisoned person, after it has been buried some time, may abandon to the earth a portion, or even the whole of the arsenious acid which it contained at the time of death, because the ammonia which it developes during putrefaction converts the arsenious acid into a soluble arsenite, which is carried away by the liquids arising from the body, and by the rain. It may easily be conceived that this arsenite may be promptly decomposed by the sulphate of lime contained in the earth and changed into insoluble arsenite of lime.

After some considerations in support of these assertions, M. Orfila introduced into a Marsh's apparatus, previously tested, a solution prepared by boiling seven pounds of earth from the cemetery of Montparnasse, with distilled water. The liquor did not give any trace of arsenic. Another liquid obtained by digesting on it, for twenty-four hours, without heat, pure concentrated sulphuric acid, then boiling it for six hours, was put in another apparatus, previously tested; this solution instantly gave several brilliant arsenical stains. Finally, to terminate this subject, it was shown that a solution of arsenite of copper immediately decomposed sulphate of lime, giving rise to a whole precipitate of arsenite of lime.

Afterwards passing to the subject of *post mortem* imbibition, M. Orfila showed that if a poisonous liquid be introduced into the stomach or rectum of a body already cold, it will traverse the digestive canal, and extend, by degrees, first into the parts which are in immediate contact with the canal containing the poison, and eventually into the more distant organs.

"The medico-legal consequences of this fact," said M. Orfila, "are of the highest importance; in the first place, it is evident, that in an investigation made in a case of poisoning, more poison should be extracted from certain organs, if the chemical analysis is made a long time after death, than if done twenty-four or thirty-six hours after, because, in the first case, the organs in question will contain, independently of the poison observed during life, that which has come there through imbibition."

But there is another fact, of a more serious appearance; a villain might, with the design of accusing an individual of having poisoned another, introduce into the stomach, and particularly into the rectum of a corpse, a poisonous substance which would be detected by analysis, and which might give rise to the suspicion that the body was that of a person who had been poisoned. This, to the honour of the human race be it said, has never occurred. But if it were hereafter to become the subject of medico-legal investigation, it would not be difficult to put the truth in its proper light. M. Orfila presented, as a means of solving the problem, a great many considerations drawn from the symptoms experienced by the patients, from lesions of the tissue proved after death, from the quantity of liquid or solid poison found in the digestive canal, from the situation of the poison in that canal, from the effects produced by the poison on the dead tissues, whether applied immediately, or some hours, after death, and from the difference of legitimate action between poisons introduced during life, or after death, &c. He concluded with a consideration, which, alone, is sufficient to resolve the difficulty. In the case of poisoning during life, not only is the poison discovered absorbed in all the organs, but likewise between each part of every organ; thus, the liver of a man poisoned by arsenious acid will yield arsenic, whether the superior or the inferior portion of that viscus be examined; it is not so, soon after death, when the poison comes there by imbibition; then, indeed, the part nearest to the stomach is

arsenical, while that farthest from it is not so. And, even admitting that, in consequence of the progress made by the imbibition, the whole of the liver should contain arsenic, the lungs, the heart, and more especially the brain, can contain it only a very long time after death.

Besides, it has been ascertained that certain poisons are decomposed by the organic fluids with which they are in contact; so that, having become insoluble, their progress is stopped. Thus the effects of imbibition are often neutralized: in these cases, it may easily be conceived that the parts most distant from the stomach and rectum, into which the poison has been injected after death, never receive the smallest portion of the poisonous substance.

In support of these considerations, M. Orfila performed the following experiment:—

He opened the body of a woman, who died on the 27th of October, into which a solution of 60 centigrammes of arsenious acid, in 140 grammes of water had been introduced at ten o'clock in the morning of the 30th. The body had been lying on the right side ever since the injection. The superior portion of the left lung was removed: a slice was cut from the superior portion of the liver, and another from its inferior portion. These three portions of organic matter were dried in three new porcelain capsules. They were carbonised by pure concentrated nitric acid, and the three carbons were boiled in distilled water for half an hour: the filtered liquids were introduced into three Marsh's apparatus, previously tested: no arsenic was obtained from either the lung or the upper portion of the liver: the inferior portion of the latter organ,—that which had been in immediate contact with the stomach,—gave a few small shining arsenical stains.

The sitting terminated at a quarter past four.

ENCOURAGEMENT OF SCIENCE IN ENGLAND.

To the Editors of The Chemist.

GENTLEMEN,—

Knowing how able and strong an advocate your valuable Journal is, for the improvement, advancement and encouragement of the arts and sciences, and all persons connected therewith, I take the liberty of saying a few words, in reference to the same; though with great diffidence, being aware of the many censures and criticisms I expose myself to, by thus publicly expressing my humble sentiments; at the same time, submitting them for the public consideration, hoping that the subject may be seriously taken up.

In the first place I would direct your notice to the fact of the French nation possessing the greatest genius for invention, and the British for improving on the same. Is not this a shameful degradation to our nation? Are we so degenerated a race, as to sit down tamely, knowing that the French Chemists are excelling us? Have we not the spirit, genius, mind, perseverance and emulation of our ancestors? Is not the *vis vitæ* handed down from one generation to another, and does it not strengthen and increase, in proportion, as the civilisation of the world advances? Certainly, but why have we not proofs of such? It is easily answered. In France, in the first place, there are free institutions, having liberal-minded men to preside over them. Is it so in England? If a man is desirous of becoming an useful member of society, are there any public schools open for talent to improve itself in? Is a man to be despised, because his circumstances will not allow him to send his children to an medical college? If poverty is not a crime, why should not these people also partake of the benefits, which a civilised nation, in an enlightened age, affords? Why should we not expect something from this class of society? In justification of which question, I would enquire, from what station in life did many of our most clever and leading men of the day spring?

In the second place, I would ask, who are these French Chemists? They are a select body of men, having good education and possessing well cultivated minds; which are ensured to the members of the science, by every one being obliged to undergo a strict examination, before entering upon the duties of his profession. Is it not owing to any persons being able to set up in business, without previous examination, that we are accounted inferior to the Chemists in France? Do not grocers and such description of people, presume to sell drugs in the present day? And can such men have a proper knowledge of the medicines they are vending? It is too true, but I trust the day is near at hand, when the public will be convinced of the danger attending such a state of things, and that a total stop will be put to it.

In the third and last place, can it be wondered at, that most of the newly discovered medicines have been brought to light through the unceasing labour, study and deep research of the French chemists, and that it is to them we are highly indebted for the same, when it is known, that public rewards are distributed on such occasions? Have we an examination, or distribution of public

rewards to stimulate us to study so vast, unfathomable and pleasing a science as chemistry, the elementary principles of our very existence, the atmosphere we breathe and the world we live in; a science, which displays to all, a Supreme Being's sublime works, which are systematically arranged, and to be accounted for by certain natural laws, by means of which, the globe itself is maintained in proper order; a science, which unfolds, to the man of deep research and persevering study, the hidden secrets of nature, thereby raising him above the common level of mankind, enabling him to behold the various daily changes and phenomena of nature, and opening a wider expanse for his researching mind to work upon, at the same time being a continual source of reflection and amusement? No; such is not; and consequently, let us endeavour to obtain the privileges of free institutions, examinations, and public rewards; let us arouse the organs of our brain into a state of activity, and make known to the world, that it is not only in one, but in every branch of science, that we equal, if not excel all other nations. In like manner as England's flag waves victoriously over the whole seas, so let her inventive genius and spreading flame resound from pole to pole; and as the conqueror combines mercy with strength, so let the man of genius, to knowledge, add benevolence and liberality, by making known, for the benefit of the public at large, his new discovery or invention.

Should the contents of this letter be judged consistent with the dictates of common sense and reason, I earnestly trust that the many, whose influential power is great, will partake, equally with myself, of the zealous feeling, which I entertain in the cause, and may such be proved by their exertions in its favour.

Sincerely trusting you will, at your own convenience, insert this letter in your valuable Journal, should the subject be considered worthy,

I remain, Gentlemen,

Yours very respectfully and obliged,

ALFRED WATTS.

March 4th, 1841.

GILDING AND SILVERING PILLS.

GENTLEMEN,—

Feeling assured that your useful and valuable Journal is at all times acceptable for the attainment of knowledge, I take the liberty of enquiring through the medium of "The Chemist" the best way of gilding and silvering pills, as the present mode adopted by druggists is very inferior and attended with great waste.

I should feel obliged by some of your numerous readers throwing a light on the subject that may benefit the trade in general.

Your obliged,

B. B.

LATE HOURS, &c.

To the Editors of The Chemist.

GENTLEMEN,—

In reply to F. B. B's letter, addressed to you, dated 30th of November, 1840, I beg to suggest a much better plan than the one proposed by him, which, after fourteen years' trial, I have found to work well for the comfort and improvement of the young men.

They open the shop at six o'clock every morning in the summer season, and at a quarter to seven in winter. They close the shutters every night, Saturday excepted, at nine o'clock. I allow them from six in the morning till half-past eight o'clock before they wash, and three quarters of an hour for washing, &c. Every Wednesday in each week two of them are at liberty alternately from a quarter to two o'clock until five, for recreation; and every evening, two have from seven until nine o'clock for reading in a small back office, so that I may know they are not spending the time allowed foolishly; and in order to give them a still better chance for improvement, if so disposed, I subscribe to the Mechanics' Institution, and allow them to get out any book for improvement they may wish to have; first shewing it to me for my approval. If this meets your approbation and you think it worthy of insertion, you will oblige

A CONSTANT READER OF THE CHEMIST,

Salford, March 14, 1841.

LATE HOURS AND SUNDAY TRADING.

To the Editors of The Chemist.

Aberdeen, 3d April, 1841.

GENTLEMEN,—Perceiving that the attention of your readers has been called to this subject in a late number of your journal, may I be allowed to state to them the plan which has been found successful in this quarter, in lessening the grievance complained of by your Plymouth correspondent.

In February, 1839, in consequence of a memorial from their apprentices and assistants, a meeting of the chemists and druggists of Aberdeen was held to take into consideration the means which might be recommended for affording to the requisitionists an increased facility for mental cultivation and improvement; and amongst others the following resolutions were unanimously adopted:—

That on the evenings of every day, with the exception of Saturday, the shops should be closed exactly at 9 o'clock. That the shops should be opened in the summer quarter at 7 o'clock in the morning, in the winter at 8 o'clock, and during the spring and autumn at half-past 7 o'clock.

That all shops should be closed during divine service on the Lord's day.

With the view of giving the requisitionists an opportunity of employing their leisure hours to good advantage, their masters at the same time agreed to establish a library of books, principally on pharmacy and the collateral sciences—and to support it by an annual subscription of ten shillings each, and also a subscription of one guinea on the enrolment of every new apprentice.

These resolutions have now stood the test of two years. The society, which has so happy a beginning, is on the increase, and the library which the above subscriptions will every now and then continue to improve and enlarge, at present consists of upwards of two hundred volumes.

On the anniversary of these changes the members of the society dine together—and our occasional meetings have been the means of promoting great harmony and much good feeling amongst us. There is now little of the jealousy or want of confidence to which your correspondent refers,—and the public are so fully aware of our strict observance of the appointed hours, that no one requiring medicines will allow *nine o'clock* to pass by without sending for them. Let the druggists in Plymouth, and other places, who groan under the daily grievance of sixteen hours' shopkeeping, resolve to imitate the good example of their brethren in Aberdeen, and they may depend on it that the public will soon conform to the new state of things, and that they themselves will be none the worse, and their apprentices and assistants much the better, for the arrangement.

I remain, Gentlemen,
Your most obedient Servant,
"M. S. A. D. A."

MARKING INK REQUIRING NO PREPARATION.

To the Editors of The Chemist.

Maidstone, April, 1841.

Gentlemen,—I take the liberty of sending you this recipe for marking ink requiring no previous preparation, trusting that you will think it worth insertion in your valuable periodical, which deserves the support of all.

Take ʒj of nitrate of silver, which dissolve in ʒvj of water. Add to this solution as much liquid ammonia as will re-dissolve the precipitated oxide, with sap-green to color it, and mucilage to make the quantity amount to one ounce. Traces written with this liquid must be instantly passed over a hot Italian iron, or held before the fire until they turn to a deep black.

I remain, yours respectfully,
A Retail Chemist.

BOOKS RECEIVED.

The Edinburgh Monthly Journal of Medical Science. Edited by John Rose Cormack, M.D., No. IV, April.

[This number contains, among other important papers, the first of a series of articles, by Dr. Christison, entitled "Cases and Observations on Diabetes," to which we would particularly call the attention of our readers.]

Proceedings of the Meteorological Society, during the Session 1838-1839. Also—

A Table of MS. Scientific Papers in the Possession of the Meteorological Society, 20, Bedford Street, Covent Garden, up to the Anniversary Meeting, 1840.

A Table Descriptive of Meteorological Observations in the Possession of the above Society, April, 1840.

TO CORRESPONDENTS.

Oxygen.—The information received is correct only as regards the first four numbers.

A Reader of "The Chemist" is informed that the Electro-Galvanic Machine, for the purpose of Medical Galvanism, may be obtained at Mr. Clarke's, Philosophical Instrument Maker, near the Adelaide Gallery, Strand. The price of the machine is 2*l.*; and the Smee's battery to work it, 14*s.*

Nota Bene.—*All Communications and Books for Review must be addressed, "To the Editors of The Chemist, care of Mr. Hastings, Publisher, 13, Carey-street, Lincoln's Inn Fields, London." Communications must be pre-paid, and sent before the 15th of each month; Books for Review, before the 10th.*

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THE CHEMIST.

I. CHEMISTRY.

ON THE COMBINATION OF HYDRATED SULPHURIC ACID WITH DEUTOXIDE OF NITROGEN, AND ON THE MEANS OF DETECTING IN THE SULPHURIC ACID OF COMMERCE THE PRESENCE OF NITRIC AND HYPONITRIC ACIDS, AND OF DEUTOXIDE OF NITROGEN.*

BY A. ROSE.

I. The sulphuric acid of commerce always contains more or less of an oxygenous compound of nitrogen, and, on this account, is colored of a red or black brown, when a solution of protosulphate of iron is thrown in. This action is commonly attributed to the presence of nitric acid, which it is said, is formed by the decomposition of the white crystals observed in the leaden chambers, or else by the direct oxidation of the hyponitric acid in these chambers. According to MM. Gaultier de Claubry and Henry, these white crystals contain sulphuric acid, hyponitric acid and water, and are decomposed, when dissolved in water, into sulphuric acid, nitric acid, and deutoxide of nitrogen, which is disengaged.

The quantity of nitric acid found in sulphuric acid, although inconsiderable, presents much inconvenience in the preparation of hydrochloric acid, for it always causes the formation of a certain quantity of chlorine which remains mixed with the latter acid.

In order to purify sulphuric from nitric acid, as well as from the sulphate of lead which it contains, it is generally submitted to distillation. In this respect I have followed the directions given in all works.† In distilling an acid which was powerfully colored by the protosulphate of iron, I changed the receiver, when a few ounces of liquid had passed over, expecting that it would contain water and nitric acid. But to my great surprise, I found that this part of the liquid, as well as the others, was quite free from nitric acid and all other oxidised compounds of nitrogen, while the residue contained more than before. This fact had already been observed by Barruel, and afterwards confirmed by Professor Wackenroder.‡ In another operation, in which I employed four pounds of the same acid, I obtained a similar result; the receivers contained one pound and a half of perfectly pure sulphuric acid.

II. I afterwards submitted to distillation a mixture, prepared on purpose, of four pounds of pure sulphuric acid, and four ounces of nitric acid of 1·4 density, frequently renewing the receiver. The three ounces which passed over first were very watery, and contained much nitric acid, and very little sulphuric; the next two or three ounces were almost exclusively composed of sulphuric acid, containing but little nitric; the next two ounces which were distilled contained only a trace of nitric acid. Then came a pound and some ounces of perfectly pure sulphuric acid. Finally there passed over an acid containing traces of an oxygenous compound of nitrogen; I then stopped the distillation.

The residue was yellowish, and disengaged deutoxide of nitrogen when mixed with water; this gas was converted into nitrous vapors in the air. In order to follow up this reaction, I introduced a certain quantity of the acid into an inverted eprouvette filled with distilled water; the vessel was filled with a colorless gas which became red in the air. It was, therefore, positively deutoxide of nitrogen. The residue acted generally, with reagents, like the solution of the *anhydrous sulphate of deutoxide of nitrogen*, described by H.

* *Poggendorff's Annalen*, vol. L.

† Geiger's *Pharmacie*, new edit. p. 273.—Mitscherlich's *Chemie*, p. 480.

‡ *Annalen der Pharm.* vol. xviii. p. 153.

Rose,* which led me to think that it might be an analogous compound. Experiment confirmed my opinion.

In order to be certain that the residue of the distillation really did contain deutoxide of nitrogen, and that it contained neither hyponitric nor nitric acid, I diluted half an ounce of it with sufficient water to drive off all the deutoxide of nitrogen. I then divided it into two parts: into one I poured a drop of nitric acid, and I then boiled both for the same time, namely, for a few minutes. The portion to which I had added the nitric acid, became deeply colored by the addition of a mixture of sulphuric acid and protosulphate of iron; the others, on the contrary, did not acquire any color. If the residue had contained hyponitric acid, the addition of water would have occasioned the formation of nitric acid, and the liquid, when boiled, would have presented the reaction of that acid. This process has always been successful in investigating whether sulphuric acid contained, in the state of combination, deutoxide of nitrogen, or hyponitric acid.

The protosulphate of iron is an excellent test for the slightest traces of deutoxide of nitrogen, and hyponitric and nitric acids; still it is always necessary, in testing for these bodies, to add to the liquid to be examined, a sufficient quantity of pure sulphuric acid, else this method is not strict.

It is easy to distinguish, in concentrated sulphuric acid, the deutoxide of nitrogen and hyponitric acid from the nitric acid; we have only to add a dilute solution of bichromate of potassa, for the deutoxide of nitrogen and hyponitric acid to convert the acid of that salt into protoxide of chromium, and to become nitric acid. The liquid then acquires a green color, only the solution of bichromate of potassa must be added drop by drop, because, otherwise, the green tint is hidden by an excess of the salt. As for the nitric acid, it cannot necessarily reduce the bichromate.

The employment of permanganate of potassa is not so advantageous in these reactions, because it is altered by powerful acids; however, it may be used if the sulphuric acid be previously diluted with about six parts of water. Indeed, make a mixture of sulphuric acid and pure distilled nitric acid, dilute this mixture with six parts of water, and add to it, when it has become quite cold, a few drops of permanganate of potassa, the latter will not be discolored. On the other hand, by diluting with six parts of water, the residue of the distillation of the sulphuric acid, which residue, in my opinion, is composed of a solution of sulphate of deutoxide of nitrogen in sulphuric acid, the solution of permanganate of potassa is discolored. When the diluted liquor is heated but for an instant, in the same manner as the mixture of sulphuric acid and protosulphate of iron detect in it the presence of deutoxide of nitrogen, it likewise discolors the solution of permanganate. But when the same liquid is heated for a longer time, the mixture of sulphuric acid and protosulphate of iron do not color it, and a few drops of a solution of permanganate of potassa are not discolored.

Professor Wackenrodert proposed to add to sulphuric acid, concentrated or diluted, a solution of deutosulphate of manganese; this salt is not discolored by the presence of nitric acid, but immediately by deutoxide of nitrogen and hyponitric acid; however, the solution of permanganate of potassa is a still more delicate test.

A portion of the residue arising from the distillation of the mixture of sulphuric and nitric acids, expressly prepared, was distilled in a retort heated by a lamp. I divided the first products which passed over, with a view of examining them. At first, sulphuric acid, containing very little deutoxide of nitrogen, came over. However, the quantity of the latter body increased in the succeeding portions. The second portion was a concentrated solution of sulphate of deutoxide of nitrogen in concentrated sulphuric acid, a solution which acts with reagents exactly like that of this combination in the same acid, as I shall show presently. There remained in the retort only a trace of sulphate of lead. The second portion was white, turned yellow on being heated, became green on the addition of water, then blue, and, finally, colorless by disengaging a quantity of deutoxide of nitrogen.

III. I have also tried to prepare in the direct way a compound of deutoxide of nitrogen and hydrated sulphuric acid.

When deutoxide of nitrogen, dried over chloride of calcium, is driven into concentrated and distilled sulphuric acid, contained in a spacious vessel, and not in contact with the air, the gas is rapidly absorbed if the current is not brisk, and no bubble escapes. In the contrary case, a certain quantity of gas passes through the liquid without being absorbed. When all the precautions are observed, a light crystalline deposit is produced, which attaches to the sides of the vessel, but which on being shaken, immediately disappears, being dissolved in the acid. If the current of gas be continued, the liquid acquires a lilac color, then a light blue, and, finally, a deep blue, without any perceptible increase of temperature.

* *Poggendorff's Annalen*, vol. xlvii. p. 605.

† *Annal. der Pharm.* vol. xviii. p. 154.

The liquid becomes thick, and acquires a syrupy consistence; by stirring, it is changed into a frothy mass, which again becomes blue and syrupy by repose. Finally, by prolonging the current of gas still further, the liquid is converted into a white, solid, and crystalline mass, which melts at a moderate heat, without decomposition, and solidifies *de novo* on cooling.

If the deutoxide of nitrogen were not dried before being driven into the sulphuric acid, the mixture would be slightly heated; however, the crystals appear to be formed quicker, which makes me think that steam favors their formation.

When water is added in successive portions to the crystalline mass, it disengages deutoxide of nitrogen, and there is produced, according to the quantity of water added, a green, blue, and, finally, colorless liquid. The crystalline mass dissolves without alteration in concentrated sulphuric acid, and when the solution is distilled, the excess of sulphuric acid first passes over, mixed with a little sulphate of deutoxide of nitrogen; and finally, the concentrated solution of that combination is sulphuric acid, which solution may be re-distilled several times without being decomposed. I have examined this solution, as well as the crystalline mass, to detect in it the presence of nitric and hyponitric acids, by following the method above indicated, but I found not a trace. To govern the reaction I likewise added, in the following experiments, a drop of nitric acid to half the dilute solution, and boiled both halves for the same time. The portion containing the nitric acid naturally gave a deep brown color, with the mixture of sulphuric acid and protosulphate of iron; the other did not change color.

The sulphate of deutoxide of nitrogen is decomposed by water as rapidly as the solution of the same body in sulphuric acid; however, when cold, the decomposition is not so complete. If the solution be diluted with a great quantity of water, and boiled for a long time, all the deutoxide of nitrogen is disengaged from it. The solution of permanganate of potassa is discolored by it as long as the mixture of sulphuric acid and proto-sulphate of iron detect in it the presence of an oxide of nitrogen.

IV. According to my experiments, the compound of anhydrous sulphuric acid and deutoxide of nitrogen, described by H. Rose, acts in the same manner. When diluted with water, the same shades of color are produced, and deutoxide of nitrogen is disengaged; if the diluted solution be boiled for a few minutes, all this gas escapes, and the mixture of sulphuric acid and protosulphate of iron indicates the absence of nitric acid. The sulphate of deutoxide of nitrogen is therefore more completely decomposed by the presence of hydrated sulphuric acid. When the crystalline mass is diluted with a great quantity of water, and heated for a few minutes without the addition of sulphuric acid, the solution is also colored, it is true, by the mixture of sulphuric acid and protosulphate of iron, but then the liquid when cooled, also discolors a weak solution of permanganate of potassa. When the latter is no more discolored by the liquor, boiled for some time, and cooled, no reaction is obtained with a solution of protosulphate of iron and sulphuric acid.

These crystals, then, act exactly like those which are produced in the manufacture of sulphuric acid, or those which are formed when hyponitric acid is passed into concentrated sulphuric acid. In the latter case, they are composed, as it is at present admitted, not of deutoxide of nitrogen, sulphuric acid and water, but of hyponitric acid, sulphuric acid, and water.

V. This identity of characters led me to prepare the latter crystals, with the view of ascertaining their composition.

For this purpose, I passed hyponitric acid into a spacious flask, containing an ounce of distilled sulphuric acid, and hermetically connected with a pneumatic trough. The hyponitric acid was produced by boiling a mixture of one part of fecula and 10 of nitric acid at 1·3 (according to Liebig's process). The air contained in the flask immediately took a deep-red color. The gas which was disengaged was collected: it consisted for the most part of carbonic acid,—a product which always accompanies hyponitric acid in the action of nitric acid on fecula. As, contrary to my expectation, no oxygen was disengaged, I discontinued the experiment at the expiration of half-an-hour; a yellowish-green liquid was formed.

This liquid disengaged much deutoxide of nitrogen when water was added. I kept it boiling thus diluted, both with and without the addition of sulphuric acid, replacing the water as it evaporated. However, for all that, the addition of the mixture of pure sulphuric acid and protosulphate of iron always occasioned in it a very deep brown color, while the solution of permanganate of potassa was not at all discolored by it.

The remainder of the liquid confined in a well-corked flask formed a mass at the end of a few hours. Very soon after it separated into two layers: the lower one was composed of white crystals, and the upper one, of a yellowish liquid, which I removed by decantation. I then dried the crystals by spreading them on a brick placed over a vessel containing sulphuric acid.

The decanted liquid contained sulphate of deutoxide of nitrogen in solution in sul-

phuric and nitric acids: diluted with a great quantity of water, and boiled, (the water being replaced as it evaporated), this liquid acquired a deep brown tint on the addition of a mixture of sulphuric acid and protosulphate of iron, while it did not discolor a dilute solution of permanganate of potassa.

The dried crystals, introduced into water, disengaged deutoxide of nitrogen, accompanied by the changes of color already mentioned; in a word, they acted like the sulphate of deutoxide of nitrogen, with this difference, however, that their aqueous solution, diluted and boiled, always contained traces of nitric acid: this minute quantity, however, evidently arose from the supernatant liquors from which it is difficult to entirely purify the crystals.

Hyponitric acid, in traversing sulphuric acid, appears to be decomposed into deutoxide of nitrogen and nitric acid; the former product combines with the sulphuric acid, while the nitric acid remains in great quantity in the supernatant liquor. It is thus explained why the crystals contain nitric acid, or nitrate of deutoxide of nitrogen.

VI. Finally, I have likewise prepared these same crystals by passing sulphurous acid and deutoxide of nitrogen into a large flask filled with air, and into which I could blow air by means of a glass tube. In presence of a little water and an excess of deutoxide of nitrogen, the crystals were immediately formed. As soon as they covered the lower sides of the flask, they appeared in the middle of that vessel under the form of snowy flocks. In contact with the air, they disengaged much deutoxide of nitrogen; their solution, boiled with sulphuric acid and water, then mixed with protosulphate of iron and sulphuric acid, showed no signs of the presence of nitric acid. Now, these signs would, of necessity, have presented themselves if the crystals had been composed of hyponitric acid, sulphuric acid and water. To ascertain it, I had divided the solution into two equal parts: to one I had added a trace of nitric acid, and then boiled it for a very long time: the reaction of the nitric acid was immediately manifested; the other portion gave none. I also took care to mix each solution, diluted, boiled and cooled, with a solution of permanganate of potassa, and this experiment showed me, beyond the possibility of doubt, that no nitric acid was formed by the addition of water, and that the crystals were composed, not of hyponitric and sulphuric acids, but of deutoxide of nitrogen, sulphuric acid and water.

If, on the contrary, atmospheric air be blown into the flask, when the operation is terminated and it still is full of deutoxide of nitrogen, so as to completely discolor the flask, there is found, it is true, in the solution, when boiled, a trace of nitric acid; but this evidently arises from the water contained in the flask having dissolved the hyponitric acid which is afterwards formed. I effected the actions in this case as in the preceding experiments.

VII. These are still the same crystals that are formed in the leaden chambers, and they should naturally be produced when there is an excess of deutoxide of nitrogen in relation to the atmospheric air and sulphurous acid; for, under these circumstances, only one part of deutoxide of nitrogen is converted into hyponitrous acid, which oxidizes the sulphurous acid, converting it into sulphuric, which immediately combines with the excess of deutoxide of nitrogen. Moreover, these crystals should also be formed in presence of an excess of hyponitric acid and atmospheric air, since the sulphuric which is at first formed, decomposes the hyponitric acid into deutoxide of azote, with which it combines, and into nitric acid. When it is desired to avoid the formation of crystals in the leaden chambers, care must be taken that the sulphurous acid is always in sufficient quantity.

I will present in a future memoir the analysis of these crystals as well as of those which we directly obtained by the deutoxide of nitrogen and sulphuric acid. This operation is subject to some difficulties.

VIII. The solution of sulphate of deutoxide of nitrogen in sulphuric acid acts with reagents like fuming and red nitric acid; so much so, that we are led to consider the latter acid as a solution of nitrate of deutoxide of nitrogen in nitric acid. In support of this opinion, I may mention this fact, observed by M. Gay-Lussac, that crystals are formed when red fuming nitric acid is mixed with fuming sulphuric acid. These crystals are without doubt sulphate of deutoxide of nitrogen.

When the sulphuric solution of sulphate of deutoxide of nitrogen is distilled, there first passes over, as I have already said, the excess of sulphuric acid, and afterwards the solution itself, in a concentrated state; this solution may be distilled several times without undergoing decomposition. It turned yellow by being heated when diluted with water, disengaged deutoxide of nitrogen, and took, according to the quantity of water added, a green or blue tint, which became colorless by a greater addition, as is the case with fuming nitric acid.

However, with water only, at the ordinary temperature, this solution, the same as fuming nitric acid, cannot be completely decomposed. The two solutions, even at the expiration of a very long time, always retain the property of discoloring the solution of permanganate of potassa. By heat-

ing, on the contrary, both lose their deutoxide of nitrogen; in fuming nitric acid, this occurs more rapidly. The two solutions may be made to contain that gas, by driving it into them.

Berzelius is of opinion, that fuming nitric acid may be regarded as a solution of a compound of deutoxide of nitrogen, with quite as much propriety as a solution of a combination of hyponitric with nitric acid, in an excess of the latter. The former opinion acquires more probability, when it is considered that an analogous compound exists with respect to sulphuric acid.

I likewise endeavoured to discover the cause of the sulphuric acid of commerce being so often impregnated with sulphate of deutoxide of nitrogen: the nitric acid in it is very rare.

With this view, I added to concentrated sulphuric acid sufficient water for the solution to have a density of 1·2. This is the ordinary density of the acid as it goes out of the leaden chambers. Moreover, I added to a portion of that acid, thus diluted, sulphate of deutoxide of nitrogen; to another portion, a solution of the same sulphate in sulphuric acid; to a third, pure sulphuric acid; and to a fourth, fuming nitric acid. I then heated each portion separately, in retorts, until sulphuric acid was distilled over; the residue always consisted of pure sulphuric acid. However, especially as regards nitric acid, I should have heated it until the remaining sulphuric acid had a density of 1·84. Even in mixing concentrated sulphuric acid with nitric acid, and in heating the mixture to a moderate heat, almost pure sulphuric acid was obtained as a residue. When the two pure and concentrated acids are mixed, so as not to become heated, and the mixtures left for several weeks, it does not appear to undergo any further decomposition; if very great quantities be rapidly mixed, a trace of sulphate of deutoxide of nitrogen is formed, the formation of which is necessarily owing to the increase of the heat of the mixture. If the latter be strongly heated in a retort, there is a decomposition; the neck of the retort is filled with vapour, and sulphuric acid charged with nitric acid is distilled over, then pure sulphuric acid; the residue then contains sulphuric acid holding in solution sulphate of deutoxide of nitrogen. If sulphuric acid be impregnated with organic matters, and if it be sought to discolor it by the addition of a few drops of nitric acid, it is always found that the sulphuric acid always then contains sulphate of deutoxide of nitrogen.

From this it is evident that the sulphuric acid of commerce ought to be free from every nitrous compound when it is of the density 1·84; but it is rarely found in that state of concentration. It can be impregnated with sulphate of deutoxide of nitrogen only when it has been discolored by nitric acid. Of late years, sulphuric acid has begun to be concentrated in platinum alembics, so arranged that the weak acid continually passes into that which is more concentrated: perhaps that is the cause of the deutoxide of nitrogen not being driven off.

Barruel proposed, for the purification of sulphuric acid, to heat it to 200° with sulphur, in order to destroy the nitrous acids, and afterwards to distil the sulphuric acid. But this manipulation is superfluous when the sulphuric acid is distilled; for then, even if it contain nitric acid, distillation always yields a pure acid. This product is pure, as I have already observed, even when a pound of sulphuric acid is mixed with an ounce of nitric—a proportion which certainly is not met with in commerce; only it is necessary, in this case, to change the receiver frequently. When sulphuric acid contains sulphate of deutoxide of nitrogen, pure acid immediately passes over.

In order to procure pure sulphuric acid before using it in the preparation of hydrochloric acid, it must first be mixed with two parts of water, that it may contain nitric acid, or sulphate of deutoxide of nitrogen: then the acid thus diluted is heated in a retort, until sulphuric vapour pass over. In this manner, there is also the additional advantage of this acid presenting a density of 1·85.

In the distillation of sulphuric acid, many precautions are recommended for avoiding the explosions which sometimes break the neck of the retort. However, if it be uniformly heated, all these precautions, and even the use of the platinum wire, will become useless, and I have constantly distilled sulphuric acid over the bare fire without having had to complain of such accidents. It is necessary that the neck of the retort be not too long, and that it should be as broad as possible: the receiver must not rest immediately on the neck, but must be separated from it by a platinum wire. The heat should be uniform: a charcoal fire is the best. The retort is filled to two-thirds, and, after being carefully placed on a small sand bath, it is strongly heated until vapors arise from the acid. The fire is afterwards lowered, and the acid is allowed to boil gently. It is kept in this state, uniformly heated, and care being taken that the boiling does not stop. If that should happen, the heat must be increased with great care, so that the acid may boil neither too suddenly nor too fast.

NITROCYNNAMIC ACID AND ITS SALTS.*

BY M. MITSCHERLICH.

M. MITSCHERLICH read to the Royal Academy of Sciences, Berlin, at its sitting of the 9th of December, 1840, a memoir on nitrocynnamic acid and its salts.

Nitrocynnamic acid is obtained by throwing pulverised cynnamic acid into concentrated nitric acid. For this purpose, nitric acid, which has been freed from nitrous acid by boiling, and which has been cooled as much as possible, is used. When but a small quantity of cynnamic acid is thrown in, it is at first completely dissolved; in a few minutes the liquor becomes hot, and a crystalline compound separates; the disengagement of heat lasts as long as this compound forms and separates. If one part of cynnamic acid be added to eight parts of nitric acid, the temperature of the mixture rises to 40° C.; none of the nitric acid seems to be decomposed: the nitrocynnamic acid which is separated forms a light and considerable mass of crystals, which absorbs the liquid like a sponge. When it is wished to prepare the liquid in great quantity, cynnamic acid and nitric acid, previously well cooled, in order that the temperature may not be raised above 60° C., are thoroughly mixed. As nitrocynnamic acid is nearly insoluble, water is poured on the mass, so as to wash away all the free nitric acid; it is then dissolved in boiling alcohol, from which nearly all of it separates on cooling; it is filtered, and washed with cold alcohol.

Nitrocynnamic acid is white, with a slight yellow reflection: the crystals are so small, that it is difficult to ascertain their form; it fuses at about 270° C., and becomes a crystalline mass on cooling; heated above 270, it boils, and is decomposed. In cold water it is nearly insoluble; it is very soluble in hot water. On account of its insolubility in alcohol, it is easy to separate it from other acids which resemble it in properties. At 20° C. it is soluble in 327 parts of alcohol, whilst cynnamic acid is soluble in 4·2 parts, benzoïc acid in 1·96, and nitrobenzoïc acid in less than equal parts. Boiled with a little water, it does not form an oily liquid which collects at the bottom of the boiling saturated liquid, like benzoïc and nitrobenzoïc acids. It is not very soluble in hydrochloric acid, which does not decompose it.

With bases, it acts as a weak acid; carbonic acid displaces it. Its alkaline salts have a neutral reaction; they are very soluble, while the others are but little or not at all so. The alkaline salts are obtained by saturating the base with the acid, and the other salts by adding a neutral nitro-cynnamate, and in preference, the nitro-cynnamate of ammonia to the soluble salt of the base with which it is desired to combine the acid. The nitro-cynnamate of soda and that of potassa may be obtained by evaporating the solution into groups of crystals: the ammoniacal salt may be decomposed like the benzoate of ammonia; ammonia is disengaged, and the acid separates, but not in very distinct crystals: the salts of potassa and soda do not undergo any alteration in the acid. Among the other salts, that of magnesia is the most soluble. When an alkaline nitro-cynnamate is added to a dilute solution of a salt of magnesia, the magnesian salt is not immediately deposited; but, in a few minutes, groups of the new nitro-cynnamate are formed. The other salts are pulverulent precipitates; that of silver is very little soluble in water. The nitro-cynnamates detonate when heated, especially those of potassa and soda: if the salt of silver be heated with care, it is instantly decomposed, and so completely, that all the silver may be collected. These salts are decomposed by the powerful acids, which separate from them all the cynnamic acid.

When nitro-cynnamic acid is boiled with 20 parts of alcohol, to which a little sulphuric acid has been added, at the end of a few hours, provided the temperature does not exceed 80° C, the acid is completely dissolved. As the liquor cools, the ether separates in prismatic crystals, whose form it is difficult to characterise; by dissolving in alcohol to which a little ammonia is added, which does not decompose this ether, it is obtained perfectly pure. Boiled with a dilute solution of potassa, it yields nitro-cynnamate of potassa and alcohol. This ether fuses at 136° C. and boils at 300° C. at which temperature it is decomposed. Cynnamic acid is distinguished from benzoic acid, by giving, when distilled with dilute nitric acid, oil of bitter almonds, and also more easily by the formation of nitro-cynnamic acid.

Burnt with oxide of copper, 0·5165 gram. gave 0·1695 gram. of water, and 1·0525 of carbonic acid without employing oxygen, and 0·299 gram. furnished 18·32 cubic centimetres of nitrogen at 0°, and at the pressure of 760mm, consequently, 100 parts of acid are composed of

Carbonic acid . . .	56·38
Hydrogen	3·64
Nitrogen	7.73
Oxygen	32·24
	99·99

and if its formula is 18 C, 14 H, 1 N, 8 O, it should contain

* *L'Institut*, No. 378; March 25, 1841.

Carbonic acid	56·34
Hydrogen . . .	3·58
Nitrogen . . .	7·25
Oxygen	32·78
	99·95

The analysis so nearly resembles the formula, that the composition may be regarded as accurate, and it may be considered as formed of one atom of nitric acid in combination with one atom of nitro-cynnamic acid, one atom of water being eliminated.

In order to determine the composition of the salts, the salt of silver was analysed: it was prepared by precipitation with neutral nitrate of silver and nitro-cynnamate of ammonia: when this salt has been dried at 100°, and heated to 140°—the point at which its decomposition commences, it does not give off water. The salt of silver analysed was dried at 120°; 1·0661 gram. of nitro-cynnamate of silver gave, when carefully decomposed, 0·3785 of silver; 1·8055 yielded 0·8757 of chloride of silver, and 1·2535 produced 0·590 of the same chloride. According to the first experiment, 100 parts contain 38·12 of oxide of silver; according to the second, 38·31, and according to the third, 38·11. From these investigations, it results that while the acid is combined with the silver, another proportion of water is separated, and that the acid combined with the base consists of 10 C, 12 H, 2 N, 7 O. By calculating the composition of nitro-cynnamate of silver according to this formula, it was found to contain 38·41 of oxide of silver, and 61·59 of acid.

The composition of the acid may be still better ascertained by analysing its ether, which may be obtained quite as easily as its salt of silver. 0·52375 gram. of ether gave 0·234 water and 1·13075 carbonic acid; 100 parts of this body therefore contain 59·74 carbonic acid, and 4·955 hydrogen; and if it consists of 18 C, 12 H, 2 N, 7 O + 4 C, 10H, 1 O, we then have

Carbonic acid . . .	60·14
Hydrogen . . .	4·91
Nitrogen	6·33
Oxygen	28·61
	99·99

Although the action of nitric acid on cynnamic acid has given rise to many experiments, nitro-cynnamic acid has not yet attracted much attention, because the temperature has been raised too high. Indeed, if more than one part of cynnamic acid be added to eight parts of nitric, the temperature rises beyond 60°, and when that temperature is exceeded the nitric acid is quickly decomposed, and an acid, first observed by M. Plantamour, is formed, whose composition has been investigated by MM. Marchand and Mulder, and whose salts M. Mulder has carefully studied. That chemist prepared this acid not only with cynnamic acid, but also with oil of cinnamon, and benzic acid. The crystallised acid consists, according to him, of 14 C 10 H 2 N 8 O, and, when combined with oxide of silver, of 14 C 8 H 2 N 7 O; it acts with respect to benzoïc acid, exactly like nitro-cynnamic acid. M. Mulder announced that nitro-benzoïc acid is formed by long boiling with a disengagement of nitrogen; but if nitric and benzoïc acids be heated together for a short time only, so as to disengage but little nitrous gas, the benzoïc acid is completely converted into the new acid, so that the disengagement of nitrous gas is owing to the reaction of the nitric acid on the nitro-benzoïc acid. The acid thus prepared, burnt by means of oxide of copper, gave results of similar composition to those announced by M. Mulder. A slight difference in the character of the salts, that of soda, for example, which may be obtained well crystallised, and which is not deliquescent, is perhaps owing to the dryness of our climate. This acid is evidently formed when nitric acid attacks the substances formed by the oxidation of benzoïc acid; but it is necessary to distinguish it from the acid obtained by the oxidation of oil of aniseed; this acid is not benzoïc acid, and does not contain nitrogen; it dissolves without decomposition in concentrated nitric acid, and combines with it, forming a new acid, a compound somewhat analogous to nitro-cynnamic and nitro-benzoïc acids. These acids were prepared last summer by M. Welzien, and are at present under investigation by him.*

M. Mulder gave the name of *nitro-benzic acid* to the acid which he discovered, because its composition is analogous to those of sulpho-benzic and nitro-cynnamic acids, and because it is formed in the same manner; but the name of nitro-benzoïc acid seems more correct. Cynnamic acid does not combine with sulphuric acid, like benzoïc acid; it is decomposed by it. If cynnamic acid be distilled with hydrate of lime, we do not obtain carburetted hydrogen and carbonate of lime, as with benzoïc acid; this acid is decomposed into various products: there remains carbonic acid and carbon with the lime. The mass which results from it, submitted to distillation, leaves an abundant residue resembling pitch, and the liquid which has passed over has not an uniform boiling point, and in this respect resembles sweet oil of wine; it has the odour of benzine, but is distinguished from it in being fluid below 0°; probably it is a mixture containing benzine. Future investigations alone can determine whether the latter can give

* These same acids were also discovered and analysed in France, by M. Cahours.

another carburet of hydrogen besides that which chemists have procured from its combinations with sulphuric acid, which, according to their experiments, are composed in a manner analogous to the combinations of benzine with a hydrocarbon, which would be 16 C, 16 H. According to Croft's experiments, the oily substance which is obtained when camphor and oil of cinnamon are passed through a red-hot tube, would act as a product of distillation. The experiments hitherto made do not enable us to decide whether cynnamic acid analogous to benzoïc acid consists of a carburet of hydrogen and carbonic acid, or of benzine combined with another acid, which is probable. Indeed, the latter opinion is supported by the conversion of cynnamic acid into oil of bitter almonds by means of dilute nitric acid. Now this oil may be considered as composed of benzine and formic acid minus one atom of water, in which case only the portion of the compound arising from the acid would be oxidised, whilst that resulting from the benzine would remain unaltered.

Sulpho-benzoïc, nitro-benzoïc, and nitro-cynnamic acids, belong to the same group of compounds; it must be admitted that they are compounds of an inorganic and an organic acid. In the combinations containing nitric acid, there is one atom of each; in those which contain sulphuric acid, there is one atom of benzoïc acid, combined with two of sulphuric; it is an acid with a double atom. The capacity of these acids is determined by that of the inorganic acid; the organic acid is combined with the other without having any influence on the saturation, in the same way as fluoicailic acid, fluor and silica unite with hydro fluoric acid, and as various bodies of organic origin, benzine, for instance, combine with those acids. This group clearly shows how each new atom which intervenes drives away an atom of water, so that it must be imagined that in the case where, for example, an atom of benzine and an atom of carbonic acid are in contact, an atom of water is driven off, and that when an atom of benzoïc acid and an atom of nitric acid also come in contact, an atom of the oxygen of the latter, and a double atom of the hydrogen of the benzine in the benzoïc acid are driven off under the form of water, so that a new acid results, which contains neither benzine, nor carbonic, nor nitric acid; but indeed the remaining atoms, and which have remained in the relative position which they previously occupied. In these three acids, the two acids which constitute them may in each of them have little mutual affinity, so at least we have a right to suppose, from the feeble development of heat at the time of their formation, while the quantity of heat liberated in a chemical combination may be taken as a measure of affinity. When sulphuric acid combines with benzoïc acid, or nitric acid with cynnamic, there is not so much heat disengaged as when an atom of sulphuric acid combines with an atom of water. Nevertheless, these compounds are not destroyed, either at the ordinary temperature, or by boiling solutions, with an excess of bases: they ought therefore to be considered as peculiar compounds, which have no analogy to those called inorganic.

ON NITRO-BROMO-PHENISIC AND AMPELIC ACIDS, ON CHLORO-PHENYLE AND CHLORALBINE, AND ON THE RELATIONS WHICH EXIST BETWEEN THE COMPOSITION OF SOME ORGANIC SUBSTANCES AND THEIR CRYSTALLINE FORM.—ON THE CRYSTALLINE FORM OF SOME COMPOUNDS OF THE PHENIC SERIES.

BY M. AUGUSTE LAURENT.

[The following is an abstract of two memoirs presented by M. Laurent to the Royal Academy of Sciences, Paris, at its sitting of the 5th of April, 1841.]

The first memoir contains the description of the following compounds:—

1st. *Nitro-bromo-phenisic acid* is a very well crystallised yellow body, which forms with bases very fine yellow, red, or orange salts, which are very analogous to the nitro-phenesates and nitro-phenisates.

It is prepared by adding bromine to nitro-phenisic acid. Its formula is

$C^{24}H^4Br^2(A^2O^4)^3O$ + Aq.

The anhydrous ammoniacal salt	$nbPi + H^8N^2O$.
The ammoniacal salt, dried at 100°C.	$nbPi + H^8N^2O$ + Aq.
The crystallised ammoniacal salt	$nbPi + H^8N^2O$ + 4 Aq.
The anhydrous salt of baryta	$nbPi + BaO$.
The red dried salt of baryta	$nbPi + BaO$ + Aq.
The yellow crystallised salt of baryta	$nbPi + BaO$ + 4 Aq.
The bibasic salt of lead	$nbPi + 2PbO$.
The crystallised bibasic salt of lead	$nbPi + 2PbO$ + 2 Aq.
The ½ basic salt of lead	$3nbPi + 4PbO$.

* *Comptes Rendus*; No. 14, April 5, 1841.

Nitric acid acts on it in a very remarkable manner. The two atoms of bromine are replaced by one equivalent of hyponitric acid, and, consequently, nitro-phenisic acid is obtained.

2. *Chlorophenyle* is a body crystallised in golden yellow bracteæ. Its formula is

$$C^{16}\,H^{4}\,Cl^{4}\,O.$$

It is prepared by treating chlorophenisic acid with nitric acid. The former loses five equivalents of carbon and chlorine without decomposition.

3. The result of the action of nitric acid on bromo-phenisic acid is extremely singular; no bromo-phenyle is obtained, but nitrophenisic acid. Three equivalents of bromine have therefore been replaced by three equivalents of hyponitric acid.

4. Chloralbine is a body crystallised in white needles; it is volatile without decomposition, and is not altered by potassa. Its formula is

$$C^{24}\,H^{12}\,Cl^{4}$$

I conclude from this, taking its properties into account, that it is derived from a hydrocarbon, the formula of which should be

$$C^{24}\,H^{16}$$

It is found mixed with the chloro-phenisic acid prepared with oil of coal.

5. Ampelic acid is white and crystallised. Its formula is

$$C^{28}\,H^{10}\,O^{5} + Aq.$$

It is one of the products of the action of nitric acid on oil of coal.

In the second memoir, I show that all the following compounds are isomorphous:—

Nitro-phenesic acid . .	. . $C^{24}\,H^{5}\,N^{4}\,O^{10}$
Nitro-phenisic acid . .	. . $C^{24}\,H^{6}\,N^{6}\,O^{14}$
Chlorophenisic acid . .	. . $C^{24}\,H^{6}\,Cl^{6}\,O^{2}$
Bromo-phenisic acid .	. . $C^{24}\,H^{6}\,Br^{5}\,O^{2}$
Nitro-phenesate of ammonia	. . $C^{24}\,H^{14}\,N^{6}\,O^{10}$
Nitro-phenisate of ammonia	. $C^{24}\,H^{12}\,N^{6}\,O^{14}$
Nitro-phenisate of potassium	. . $C^{24}\,H^{4}\,N^{6}\,O^{14}\,K.$

The difference between the angles varies from 1° to 2°.

Nitro-bromo-phenisic acid is not isomorphous with the preceding compounds.

From this I draw the following conclusion (which is the same as that which I gave in my thesis published in 1837, and in a memoir that I presented to the Academy a year ago:)—

In general, when hydrogen is replaced by its equivalent of chlorine, bromine, oxygen, hyponitric acid, &c. the *formula* and the *form* of the new compound are similar to those of the old one.

But this law may be modified, first by dimorphism; secondly, by isomeria; and, thirdly, by a cause pointed out in my memoir.

In order that this law might become evident, the rough formulæ which have lately been introduced into science must necessarily be rejected, and it must be admitted that groups of compounds may act in compounds.

If equivalents be employed instead of atoms, and if hyponitric acid $N^{2}\,O^{4}$ be represented by X, the compounds of the series of phenyle will have the following formulæ:—

Phenic acid, or hydrate of phenyle .	$C^{12}\,H^{5}\,O + HO$
Chloro-phenesic acid . . .	$C^{12}\,H^{5}\,Cl^{2}\,O + HO$
Chloro-phenisic acid . . .	$C^{12}\,H^{3}\,Cl^{3}\,O + HO$
Bromo-phenisic acid . . .	$C^{12}\,H^{3}\,Br^{3}\,O + HO$
Nitro-phenesic acid . . .	$C^{12}\,H^{3}\,X^{2}\,O + HO$
Nitro-phenisic acid . . .	$C^{12}\,H^{2}\,X^{3}\,O + HO$
Nitro-bromo-phenisic acid .	$C^{12}\,H^{2}\,Br\,X^{2}\,O + HO$
Nitro-phenesate of ammonium .	$C^{12}\,H^{2}\,X^{2}\,O + Am\,O$
Nitro-phenisate of ammonium .	$C^{12}\,H^{2}\,X^{3}\,O + Am\,O$
Nitro-phenisate of potassium .	$C^{12}\,H^{2}\,X^{3}\,O + KO$

1. Chlorine is isomorphous with hydrogen;
2. ,, ,, ,, hyponitric acid;
3. ,, ,, ,, bromine (which was known before);
4. Hyponitric acid is isomorphous with hydrogen;
5. ,, ,, ,, ,, bromine;
6. Bromine is isomorphous with hydrogen;
7. Potassium ,, ,, hydrogen;
8. Ammonium ,, ,, hydrogen;

Or indeed—

Oxide of potassium . water;
Oxide of ammonium . water.

This isomorphism of ammonium with potassium and hydrogen proves, therefore, that in compound bodies groups of atoms can exist.

The isomorphism of hydrogen and chlorine with hyponitric acid proves the same thing.

ON A NEW ACID DERIVED FROM CAMPHOGEN.*

BY M. DELALANDE.

The name of camphogen was given by M. Dumas to the hydrocarbon derived from camphor by distilling it with anhydrous phosphoric acid. Having been able to prepare this body in greater quantity, and more easily than heretofore, I have subjected it to some investigations. The study of the action exerted by fuming sulphuric acid, which action is very clear and furnishes a new acid forming crystallised and well defined salts, will be the principal object of this note. I will commence by detailing the analysis that I made of the camphogen which I used in my experiments, as well as the determination of the density of the vapor, which had not yet been taken.

The camphogen which was analysed had been distilled five times over anhydrous phosphoric acid; its density was 0·860 at 13°.

Its boiling point was 175° C.

0·307 of the substance yielded 0·287 water, and 0·99 carbonic acid; whence—

Carbon . . .	90·04
Hydrogen . . .	10·30
	100·34

Calculation gives—

C^{40} . .	1530·40	90·3
H^{36} . .	174·72	9·7
	1705·12	100·0

The following are the details of the experiment for the determination of the density of the vapour:—

Excess of weight of the flask .	0·355
Volume of the flask . . .	153c.c.
Temperature of the bath in degrees of the air thermometer . .	190°C.
Air left in the flask . . .	2c.c.5
Temperature of the air . .	12°C.
Barometer	0·755
Weight of the litre . . .	6·21
Density	4·78
Calculation gives—	
40 vol. vapour of carbon . .	16·864
28 vol. hydrogen . . .	1·926
Calculated density . .	$\frac{18·790}{4}$ 4·697

When camphogen is heated in a sand-bath with a slight excess of fuming sulphuric acid, no sulphurous acid is disengaged; still there is a reaction: the camphogen is attacked and disappears, and a new acid is formed, as is easily ascertained by saturating the liquid with a carbonate of baryta or lead. The soluble salts thus produced easily crystallise on cooling after filtration, if a sufficiently weak solution be operated on. If the filtered liquid be too dilute, the crystallisation of the salt may easily be effected by evaporation in the sand-bath and cooling.

I call the new acid thus formed *sulpho-camphic acid.*

SULPHO-CAMPHATE OF LEAD.

This salt is obtained by saturating the sulphuric liquor, previously diluted, with carbonate of lead; it is evaporated. The crystallisation being effected, the first crystals may be dissolved in warm water, and recrystallised. The salt is presented under the form of pearly bracteæ. The following are the results of the analysis:—

0·4 of salt gave 0·168 water and 0·495 carbonic acid:

0·420 gave 0·180 sulphate of lead:

0·400, decomposed by carbonate of soda, yielded 0·271 sulphate of baryta.

Whence is deduced:—

Carbon . . .	34·2
Hydrogen . .	4·6
Sulphur . . .	9·4
Oxide of lead . .	31·8
Oxygen . . .	20·0
	100·0

These results agree with the formula $C^{40} H^{34} S^2 O^9 Pb O = C^{40} H^{36} S^2 O^8, Pb O, 4 H^2 O$, admitting a constitution analogous to that of the sulpho-naphthalates. Indeed, we have:—

C^{40} . . .	1530·40	34·4
H^{34} . . .	212·16	4·5
S^2 . . .	402·32	9·0
O^9 . . .	900·00	20·7
Pb O . . .	1395·00	31·4
	4439·88	100·0

The desiccation of the salt was indispensable for confirming this view. It was most carefully effected in Liebig's apparatus.

1·796, dried at 120° C., lost 0·186 = 10·3 of water per cent. The salt was not altered. The loss indicated by theory, supposing four atoms of water to be expelled, is 10·1. Thus it may be admitted that sulpho-camphate of lead, dried at 120° C., is correctly represented by the formula $C^{40} H^{36}, S^2 O^8$, Pb O. It therefore presents a composition analogous to that of the dried sulpho-naphthalates.

SULPHO-CAMPHATE OF BARYTA.

Its preparation is similar to that of sulpho-camphate of lead. It is also presented under the form of crystalline bractees.

This salt exerts a very singular action on the palate: the taste is at first a very

* *Annales de Chimie et de Physique.* March, 1841.

disagreeable bitter, but in one or two minutes it changes into a sweet taste, resembling that of Spanish liquorice: it is the same with the salt of lime.

0·4 of the crystallized salt yielded 0·353 water, and 0·961 carbonic acid. The analysis was made by adding an excess of oxide of antimony.

0·434 gave 0·173 sulphate of baryta, whence—

Carbon . .	36·0
Hydrogen . .	5·3
Baryta . .	26·1
Sulphur and oxygen .	32·6
	100·0

The formula $C^{40}\ H^{36}\ S^2\ O^9$, Ba O, 4 H^2 O gives

C^{40} .	1530·40	37·20
H^{36} .	212·16	5·13
Ba O .	1069·41	26·00
S^2 .	402·32	31·67
O^9 .	900·00	
	4114·29	100·00

Experiment and theory perfectly agree: the crystallized sulpho-camphate of baryta has, therefore, the same composition as the sulpho-camphate of lead.

SULPHO-CAMPHIC ACID.

Sulpho-camphic acid may be obtained by decomposing the sulpho-camphate of lead with sulphuretted hydrogen, and evaporating the solution *in vacuo*; it occurs under the form of small deliquescent crystals. I did not analyse it.

Camphene treated by fuming nitric acid with the aid of heat, is attacked and converted into a white solid matter, crystallising in nitric acid. This matter exhales a very sweet odour: it contains a large proportion of nitrogen. The study of this substance has not been sufficiently extended for me to give its true constitution.

NOTE RELATIVE TO THE PRECEDING ARTICLE.

BY MM. GERHARDT AND CAHOURS.

In the work on the *essence of cumin*, which we lately published, we described cymen, a hydrocarbon, $C^{40}\ H^{28}$ = 4 vol. of vapour, which appears to us identical with the camphogen of M. Dumas, studied by M. Delalande. Since the publication of our Memoirs, we have had occasion to take the density of that hydro-carbon in the liquid state; we found 0·861 at 14°. M. Delalande found for camphogen 0·860 at 15°. The coincidence of the two densities is perfect. We likewise determined the boiling point of cymen by means of the same thermometer used by M. Delalande; we found it to be 175° C., that is the same degree as that at which camphogen boils.

Cymen and camphogen have therefore the same composition, the same density in the state of vapor and in the liquid state, the same boiling point, and the same chemical properties; we therefore consider them to be perfectly identical.

REMARKS ON ARSENIURETTED* HYDROGEN.

BY H. ROSE.

We ordinarily use, not only to detect the presence of arseniuretted hydrogen, but also to destroy the slightest traces of it, a solution of chloride of copper, in which this gas produces a yellow precipitate, which has a light brown reflection, and which is thus distinguished from the precipitate which phosphuretted hydrogen gives in this same solution of chloride of mercury. The composition of this precipitate is quite unknown. Stromeyer appears to be the only one who has yet studied it; and, according to him, arseniuretted hydrogen forms, with the mercurial chloride, arsenious acid, and a chloride of mercury, and an amalgam of mercury and arsenic. This precipitate is decomposed when kept under a great quantity of water: it becomes black, and consists only of bubbles and mercury. The supernatant liquor contains hydro-chloric and arsenious acids. This decomposition is exactly the same as that which water produces on the precipitate which is produced in a solution of chloride of mercury by phosphuretted hydrogen gas, and which separates into mercury, phosphoric and arsenious acids. Only this decomposition is more rapid than in the case of the precipitate by arseniuretted hydrogen. These two precipitates also act in the same manner with dilute nitric acid. At a gentle heat, they are converted into chloride of mercury, while the arsenic or the phosphorus is oxidized by the acid. This identity in the manner in which these compounds act with water and dilute nitric acid leads us to suspect a similar identity in their composition. Indeed, it is this that confirms the quantitative analysis, according to which this precipitate, produced by arseniuretted hydrogen in the solution of chloride of mercury, is represented by the formula— $As^2\ Hg^3 + 3\ Hg\ Cl$. The latter precipitate is distinguished in its composition from that produced by phosphuretted hydrogen in the chloride of mercury only in being anhydrous, while the other contains three atoms of water. This, no doubt, is the cause of their acting so differently under an elevation of temperature. That which contains phosphorus and chloride of mer-

* *L'Institut*. No. 380.

cury contains all the water necessary for converting the whole of the chlorine into hydrochloric acid, which, by means of heat, is disengaged in the gaseous form, and the phosphorus into phosphorous acid, which, by an elevation of temperature, is converted into phosphoric acid.

The precipitate formed by the arseniuretted hydrogen in the solution of mercury does not disengage, on the contrary, any gas by heat; but it is entirely sublimed, being decomposed into chloride of mercury and metallic arsenic. At the same time there is sublimed a small quantity of a reddish yellow substance, which consists of mercury, chlorine, and arsenic, and which is perhaps the substance itself, undecomposed. The sublimate often presents only a small quantity of mercury.

The composition of the precipitate which is obtained by the arseniuretted hydrogen in the solution of chloride of mercury, as well as the manner in which it acts with water, completely confirms the composition of this gas as given by MM. Dumas and Soubeiran.

The precipitate which antimoniuretted hydrogen produces in the solution of chloride of mercury has a composition analogous to that which arseniuretted and phosphuretted hydrogen give in that solution, whence it should be concluded that the composition of antimoniuretted hydrogen differs from that of arseniuretted and phosphuretted hydrogen.

ON THE SALTS OF BROMINE.*

BY M. RAMMELSBERG.

Since 1826, when M. Balard discovered bromine, that body has been the subject of many investigations. M. Balard himself has clearly and accurately explained the principal characteristics of this new elementary body. Other researches have also added to our knowledge concerning bromine, and Loewig in particular, profiting by the opportunity presented to him by the salt springs of Kreuznach, and having at his disposal great quantities of that body, has had his attention drawn to some of its properties. Nevertheless, it cannot be denied that some points of the history of this interesting body are deficient, and its combinations with oxygen in particular. For while the different compounds of this kind which chlorine and iodine form have long been known, bromine, which resembles them in properties, and in many respects should be classed with these two bodies, has presented, according to M. Balard, only one degree of oxidation, bromic acid; and furthermore, there exists but scanty and uncertain information concerning that acid itself, and concerning its combinations with bases, or the salts called bromates. Chemical works even go so far as to state that these salts have not yet been produced and studied.

Under such circumstances, it appeared to me very desirable to supply the deficiencies of M. Balard's work,—to examine whether there was not another degree of oxidation for bromine or perbromic acid, and to prepare all possible combinations of bromic acid with bases, and to study their properties and composition, and the manner in which they are acted on at a high temperature. I have at first endeavoured to explain as completely as possible the question of the existence of perbromic acid, and I then undertook a series of experiments on the bromates, which I have not yet completed.

Some subsequent experiments of M. Balard, made with the view of discovering hypobromic acid, proved that the disposition of bromine to combine with oxygen was in general extremely feeble. Bromic acid is always more easily decomposed than chloric acid, and cannot be compared with iodic acid in this respect. Although the chances of being able to obtain a higher degree of oxidation of bromine may not seem very favorable, it might be thought that this high degree, if it existed, would be, perhaps, more permanent, as regards chlorine, than the lower one. I therefore employed methods similar to those used for obtaining perchloric and periodic acids.

Bromate of potassa is immediately converted by heat, and after some very curious phenomena, into bromide of potassa; and it is impossible by means of chlorine gas, without elevation of temperature, and even with an excess of base, to produce a decomposition of its solution.

At about 120° C. bromic acid is decomposed into bromine and oxygen.

While the iodates of baryta, strontia, and lime are converted, as I have already demonstrated, by heat, into basic periodates, the corresponding compounds of bromic acid are reduced to metallic bromides.

Neither hypochloric nor permanganic acid peroxidize bromic acid. These different means, to which M. Balard has added many others, give rise to the formation of perbromic acid.

Among the bromates, I have studied those which have for bases potassa, soda, ammonia, baryta, strontia, lime, magnesia, the oxides of zinc, copper, lead, and silver, and the oxidule of magnesia. In this number, the bromate of ammonia is distinguished by the property of decomposing with violent detonation, not only with the aid of heat, but also spontaneously, at the end of a

* Read to the Academy of Sciences, Berlin, Dec. 7, 1840.

certain time, into bromine, nitrogen, and water; while oxygen is also probably liberated at the same time, or a formation of deutoxide of nitrogen occurs.

The bromates of potassa, soda, and silver are anhydrous. The first two crystallize in the form of regular systems; the last is a difficultly soluble pulverulent body. The bromates of baryta, strontia, lime, and lead contain one atom of water; that of baryta, by its insolubility, and that of lime, on the contrary, by its solubility, are difficult to obtain well crystallized. The two others are isomorphous. It is the same with the bromates of zinc and magnesia, both of which contain 6 atoms of water, and which crystallize in regular octohedra. The bromate of copper contains five atoms of water, that of oxidule of manganese is decomposed a few minutes after its preparation; the bromine becomes free, and the oxidule is deposited.

Several of these bromates combine with ammonia in the humid way. The bromates of copper and silver also take two equivalents, and that of zinc one equivalent of ammonia, besides three atoms of water.

These investigations have also made known a double salt, iodo-bromide of mercury, which may be found in the direct way, and which consists of an even number of atoms of these salts.

ON A FACT RELATIVE TO CHLOROMETRY.*

BY M. GAY-LUSSAC.

I HAVE the honor of communicating to the Academy, a fact which is of great interest in chlorometry, but the details of which I can give only in a memoir, which I hope soon to submit to it.

M. Caron, proprietor of a large bleaching establishment at Beauvais, had written to me that a solution of chloride of lime, of a known strength (100° for example), tried again the next day, and the day after, &c., successively increased in strength until 200°, and even to 400°. The experiment made in my laboratory was unsuccessful, but that was owing to M. Caron not having pointed out to me the circumstance essential to its success. This circumstance, which I was afterwards made acquainted with, consists in exposing the solution of chloride of lime to the solar light. Then tried with arsenious acid, it gave a strength which seemed to increase rapidly to double and even quadruple: but it was a false appearance. Chloride of lime or chlorite $Cl\,O + Ca\,O$, is converted by light into hypochlorate of lime, $Cl\,O^4 + Ca\,O$, which is no longer sensible to this immediate action of arsenious acid.† The nitrate of protoxide of mercury, on the contrary, acts in the same way on the two salts; that is to say, with the exception of a slight alteration of strength owing to another cause, it gives the same result with the chlorite and hypochlorite.

This remarkable conversion of chlorite of lime into hypochlorite, taking place only in the direct light of the sun and not in diffused light, does not diminish the confidence that we ought to have in arsenious acid as a certain agent in chlorometry.

* *Comptes Rendus*, No. 15. April 12, 1841.

NEW METHOD OF TESTING THE CHLORATES OF COMMERCE.‡

BY M. CHORON.

* * * "THE protoxide of lead, heated with chlorate of potassa in a glass tube closed at one end, gives puce oxide of lead ($Pb\,O^2$), mixed with a small quantity of minium. On this new reaction is founded the test which I propose with relation to the chlorates. It consists in slowly heating to fusion an intimate mixture of the chlorate and litharge in suitable proportion, covering it with a layer of chloride of sodium; in treating the fused mass with dilute nitric acid; then in collecting on a filter the puce oxide obtained, by aid of which the quantity of chlorate employed may be approximately calculated.

"This prompt and cheap process appears to me sufficiently accurate to be employed in the arts."

ANDRAL AND GAVARRET'S PROCESS OF ANALYSING THE BLOOD.§

THE blood is received into two capsules of equal capacity, each capable of containing 180 grammes of water. In one of these the first and fourth quarters of the quantity of blood drawn are collected; this portion of blood is left to itself, to coagulate. In the other capsule, the second and third quarters are collected; this portion is immediately beaten up to obtain the fibrin, which is carefully washed. The two portions of blood thus separated, should have the same composition, whatever may be the influence of the flowing on the composition of the blood collected.

When the coagulation is effected, the serum is separated from the crassamentum, and we dry—

† It is perhaps the atomic mixture $Cl\,O^3 + Cl\,O^5$, which M. Millon says, was obtained by the direct action of hypochloric acid on bases.

‡ *Comptes Rendus*, No. 14. April 5, 1841.

§ *Journal de Chimie Médicale*, May, 1841.

1st. The fibrin obtained by beating up half of the blood.

2d. The serum.

3d. The fibrin.

The dry fibrin is weighed, and we thus know the quantity of fibrin contained in the crassamentum operated on.

When completely dry, the serum is weighed; and thus its composition in water and solid materials is known.

Finally, the dried crassamentum is weighed: the quantity of water contained in it, represented by the loss undergone during the operation of desiccation, permits the quantity of solid materials of the serum which the dried crassamentum contains to be calculated; subtracting from the weight of the dry crassamentum the weight of the fibrin, plus the weight of the solid materials of the serum which it contains, and which have been calculated, there remains the weight of the globules which the crassamentum contains.

The series of operation therefore furnishes:—

1st. The weight of the fibrin.

2d. The weight of the globules.

3d. The weight of the solid materials of the serum.

4th. The weight of the water.

When it is wished to separate the organic materials of the serum from its inorganic materials, after having completely dried that liquid, the residue is weighed in order to ascertain the quantity of solid products; then it is incinerated with great care in a platinum crucible. The white mass which remains at the bottom of the crucible, represents the inorganic materials.

SINGULAR EFFECTS OF LAUDANUM ON PAPER.

To the Editors of The Chemist.

Gentlemen,—In the month of June last, I placed a bottle, containing about 4 ounces of laudanum, among my books and papers, in one of my travelling trunks. A few days after, I proceeded on a long voyage, and the ship soon encountered some heavy "squalls" in the Gulf. Boxes, trunks, &c., went to "leeward," as is usual on such occasions; my bottle of laudanum was broken, and the surrounding articles were, of course, considerably stained with it. No further effect was, however, observed, until three or four months after, when I found that every book and paper that had been wetted with the tincture presented the appearance of having been singed, in a similar manner to what they would have done had they been exposed to the action of the fire. The depth of color and rottenness continued to increase daily, and at present some pieces are so rotten that they may be easily crumbled between the fingers. The paper appears to have nothing unusual in its composition.

I should be happy to be informed whether the above effects of laudanum are to be ascribed to any of the principles of opium, or to other causes.

I am, Gentlemen,
Respectfully yours,
A. J. Cooley.

London, April 24, 1841.

II. CHEMICAL MANUFACTURES.

NEW PROCESS OF DYEING WOOL.

BY HERR KOEBU.

In the first instance I propose to use bi-chromate of potassa as the mordant for fixing the colors used in dyeing wool, in order to obtain more permanent tints and brighter colors, at less expense. According to my own experience, this salt renders colors more immovable in woollen cloths than the mordants usually employed, such as sulphate of iron, or the double sulphate of alumina and potassa, or alum. The great affinity that bi-chromate of potassa possesses for woollen as well as for coloring substances, is the reason why a comparatively small quantity of that salt is requisite in order to make the woollen take the dye. I have found that 1 kilogramme of bi-chromate of potassa is equal to 3 or 4 kilogrammes of copperas or alum. Besides, the color produced by the salt of potassa offers a greater resistance to alkalies and to the air, as well as to the operations of rinsing and squeezing, to which woollen cloths are subjected in the process of the manufacture. Hence it follows, that smaller quantities of dyeing materials are requisite to produce a desired effect than are employed according to the usual process; because the dye adheres better, and there is less of the material taken away and lost in washing with soap. In fact, the fibres of the cloth are less injured when bi-chromate of potassa is used, than they have hitherto been by the acids contained in the alum and the copperas; on the contrary, the cloth becomes softer, is easier to rinse, to wash, and to press, and consequently the same quantity of wool produces more cloth of superior quality than

can be produced in any other way.... I have also observed that bi-chromate of potassa is particularly successful in preparing the wool for the reception of certain dyes; especially for fixing logwood and fustic, whilst it has a less efficacious effect on red woods and madder.

As in my method of applying bi-chromate of potassa, all the dyes that are in general use are employed, as every shade or gradation of shade requires a proportionate difference in the ingredients, in short, as there is a very material difference in the qualities of the coloring materials used, to such a degree that double the quantity of one is requisite to produce a certain effect produced by another, it is almost impossible for me to determine the various proportions in which the bi-chromate should be used with each. It will be understood, also, that the weight of bi-chromate requisite varies according to the quantity of the dye which the wool receives; but in general I use 3 kilogrammes of bi-chromate of potassa to dye 100 kilogrammes of washed wool; I sometimes add to it 2 kilogrammes of tartar, and I boil the wool in the liquid produced by the solution of these salts, for an hour and a half. On the following day I apply the color bath prepared with the quantity of dye requisite to produce the shade that I wish to obtain.

I also succeed in obtaining green colors quite capable of resisting acids, alkalies, and exposure to the air, by dyeing the wool blue when in fleece, in manufacturing the material thus dyed into half-dressed cloths, and then dyeing it yellow in the piece, in order to obtain a very permanent green, resembling in appearance a woollen stuff of dyed green, but much more permanent.

The manner of dyeing yellow is too well known to require any description of it. Any kind of yellow dye may be used for this purpose, but I prefer fustic on account of its durability. In this process, when the material which is half dyed has to be dipped in a bath of yellow dye, in order to fix the color, I make use of a solution of muriate of tin, to which I add a quantity of water necessary to give the fluid the specific gravity of 1·2612. I take from 6 to 7 kilogrammes of this solution for 100 kilogrammes of stuff, independently of the usual quantity of alum and tartar. This solution cannot be advantageously applied to spun wool which has not been woven, because it would not admit of the use of soap, and consequently could not be pressed.

In the third place, I propose to use soda and bran, for dissolving the indigo in the vessels used for dying wool, in order to fix that coloring matter more effectively and at less expense than can be done by the use of logwood, madder, and bran, that have hitherto been generally adopted. The following is the manner and proportions in which I use soda to effect this object:—

In a vessel of the size of two metres, I heat the water to 50° C. I then throw into it 32 kilogrammes of bran, 17 kilogrammes of common soda, which contain about 23 per cent. of dry carbonate of soda, and 2 kilogrammes of indigo. I then proceed in the same manner as usual, adding to it the regular quantity of lime. Afterwards I bring the vessel to 43° and 48° C., three or four times a-day, without shaking it. In the evening I raise the temperature again to 50° C., adding 2 kilogrammes of lime, 3 kilogrammes of bran, and 2·5 kilogrammes of soda, with the quantity of indigo that I consider requisite. On the following day, and in the evening after this addition has been made, I heat the bath in the usual manner, the temperature indicated being above 50°C. If the bath has been used during the day, I add every evening the quantities of lime, bran, and soda necessary to preserve it in a proper state, even without adding indigo. My vessel being kept by this means in a state fit for use, I add from time to time, and in the evening, all the indigo to be used on the following day. It is impossible to define the quantity of this substance that it is requisite to add in this manner, for it may vary from 250 grammes to 12 kilogrammes, according to the hue intended to be produced on the following day.

After having proceeded in the manner I have explained from eight to ten weeks, I do not empty my vessel, but I only take away the sediment that is formed; and with the liquid of the old bath I formed another by the addition of 6·5 kilogrammes of bran and 5 kilogrammes of soda, with as much chalk and indigo as is necessary. As the chalk is intended to moderate the fermentation produced by the bran, it is impossible to fix the quantity of this material that ought to be put in. I generally use the quantity that I consider necessary to limit the fermentation to the point when the indigo becomes simply deoxygenised and to stop immoderate fermentation, which would be injurious to the process. In making use of soda in my vessels the same rules and practices must be observed as with ordinary vessels, excepting that neither wood nor madder is used; nevertheless, the effect can be produced with wood, with madder and bran. I prefer using nothing but bran with soda.

The bath into which I put the soda ought to be perfectly yellow, that is, the indigo should be entirely free from oxygen. When soda is made use of that contains 46 per cent. of dry carbonate, instead of common soda, only half the quantity is required to produce the same effect. Pearl-ash may also be used, if the price admits, and oatmeal instead of bran.

DISSOLVING VIEWS BY HYDRO-OXYGEN LIGHT.*

A remarkably pleasing and altogether new application of the powers of hydro-oxygen light is at present absorbing the attention of the visitors at the Royal Polytechnic Institution, where it was first exhibited on Easter Monday. The exhibition consists in displaying on the large disc in the theatre of the establishment a series of magnified pictures, properly called "dissolving views;" the effects of which are absolutely surprising to the last degree. What we ourselves saw we will endeavour to convey to the imagination of the reader by description. The first picture represented three line-of-battle ships, one English and two foreign, preparing for engagement. On a sudden, and by imperceptible means, the commencement of the action was indicated by the appearance of large volumes of smoke. These, in turn, were succeeded by a representation of the conquered foreign ships in a crippled state; their yards shot away, their rigging floating about, and the standard of England flying from the remaining stumps of masts. This accomplished, the vessels faded from the vision, their receding shadows giving place to a view of Greenwich Hospital from the river, with yachts and steam-boats at anchor. These changes are so nicely graduated that the eye scarcely recognises the illusory transformation. One of the most pleasing series of views was that in which were represented the old Royal Exchange, with its subsequent destruction by fire, the appearance of the ruins, and the (to be) new building. These changes were brought about as if by magic, the second taking the place of the first, as if it actually grew out of the canvass, for the purpose of displacing its successor. Altogether we saw eighteen of these metamorphoses. The effects we have alluded to are produced, not by mountebankism, but by science. Messrs. Cary, the celebrated opticians, are the inventors of this new and very charming application of the powers of a well-known chemical light; and their *modus operandi* is the result of philosophical principles.

APPLICATION OF ELECTRO-MAGNETISM TO MACHINERY.†

BY HERR STÖRER.

Leipsic, April 17.

The meeting of our Polytechnic Society was rendered peculiarly interesting by a lecture given by Herr Störer on his experiments in the application of electro-magnetism as a motive power. Herr Störer commenced his experiments several years ago, before Wagner's invention, and has proceeded independent of it. By merely following up and carrying out the ideas of Jacobi, to whom the first merit of the discovery is due, he has succeeded in constructing a small machine, the power of which is as yet limited to the raising of only a moderate weight and putting a turning-lathe in motion, but which is, nevertheless, sufficient to render perfectly evident the whole mechanism of the important invention, and which, as the constructor observed, needs only to be enlarged to produce more practical effects.

The principle of electro-galvanic movement has its source, as is well known, in the law of reciprocal attraction and repulsion of two iron bars, surrounded by a galvanic current, alternating with positive and negative electricity, and thereby magnetized. Herr Störer's machine consists at present of only two concentric circles of spiral iron bars, surrounded by conducting wires for the reception of the electric current. Each circle contains twelve single bars, placed at the distance of from two and a half to three inches from each other, the bars of the outer circle being about half an inch separated from those of the inner. The outer circle is fixed; the inner forms the periphery of a moveable disc, swinging-wheel, or pinion. This mechanism is brought into connection by two conducting wires with a galvanic battery, in such a manner that in the first place the bars of the one circle with positive electricity surrounded those of the other with negative electricity; then suddenly, by an arrangement in the conducting apparatus, the current is changed, and thereby electricity of the like name is produced in both circles. The consequence of this operation is, that the opposite bars, in consequence of the different magnetic power communicated to them, first attract each other, then instantly becoming, by the inversion of their poles, similar maguets with equal force, repel each other. By this regularly repeated alternation of attraction and repulsion, each bar of the internal moveable circles in succession drawn towards all the bars of the external fixed circle, and then driven, as it were, back on the next, whereby the whole disc is brought into a state of uniform motion.

The inventor makes a very moderate estimate of the cost of the machine. The expense consists chiefly in the wear of the zinc in the galvanic battery by the action of the acid; but as to the outlay for this article, it will be almost entirely counterbalanced by the precipitate which in conse-

* *Morning Post.*

† From the Leipsic *Allgemeine Zeitung*, and *The Times*.

quence of the operation is formed in this acid, and which yields a somewhat valuable chemical product.

With regard to the power of the machine, and the possibility of reinforcing it so as to produce greater practical effects, Herr Störer submits the following considerations:—The present machine, though only double the size of the one first constructed, which had six pair of bars, acts with a six-fold increase of force. Each galvanic element consists of a copper cylinder, a zinc cylinder within it, and a chemical mixture by which they are connected. Now, as respects the effect of the number of elements employed, Herr Störer makes the following observations, the accuracy of which he has proved by experiments:—"In the connection with a single element, the machine raises, with moderate velocity, 3 lb.; with two elements, 13 lb.; with three, 25 lb.; with four, 40 lb. This is approximative by an ascending gradation of power in the ratio of 1, 4, 8, 12, whence it certainly would appear that the force might not be found to augment exactly in the relation of a progressive increase of the elements." According to Herr Störer's calculations, the connections of a battery of 50 elements, with a machine in cubical contents 26 times greater than the one exhibited, would produce an effect equivalent to 50 horse power.

Still, however, after all these data and calculations, there remain several doubts as to the practicability of the application of this invention to machinery on an extensive scale. On the other hand, the results obtained by the experiments hitherto made are of sufficient importance to encourage a spirited prosecution of the discovery, which is in itself so ingenious, that it ought to be joyfully hailed by all who take an interest in the progress of civilization, as a new triumph of the human mind over inanimate matter. At all events, we Germans have just reason to be proud of an invention, the first idea of which came from a German, and all the improvements yet made in which are the offspring of German intellect and German perseverance.

ADULTERATION OF MOIST SUGAR.

BY CHARLES WATT.

Moist sugar has long been the subject of various and infamous frauds and adulterations, which are the more base, as it is an article which is used chiefly by the poor.

The most ordinary of the adulterations of sugar consists in increasing the weight of it by the addition of water, and by the admixture of sand, and also by a kind of sugar which is termed by the sugar-refiners "bastards," in which there is very little saccharine property, but a large quantity of quite worthless mucilaginous matter. Of late, however, another adulteration of such a nature has been introduced into it, and an article which is extensively used for this purpose, that it is difficult to say whether this kind of robbery on the public is most conspicuous for its baseness or its filth. We shall give a description of the substance and the manner in which it is obtained, and then point out the best means of detecting its presence.

It is well known to our chemical readers, that when fats and oils are saponified—that is, when they have been boiled for some hours with an alkaline solution, or in contact with earths or metallic oxides—they become changed in their chemical properties, and a substance is developed, which, from its sweet taste, is termed *glycyrhine*."* This substance is yielded in great abundance in the process of soap-making; but as it is suffered to run to waste with the spent leys by the manufacturers, it is from another source that it is obtained for the purpose of being mixed with soft sugar, viz., from the manufacturers of steärine or moulded wax candles. That the whole process may be rendered the more intelligible, we will describe the manner in which this glycyrhine is formed, and which is the residuum or refuse left after making the oleïc and steäric acid.† The operation of forming steärine for candles is this: a quantity of tallow‡ is put into a wooden vessel, having a steam-pipe perforated with holes traversing the bottom of the vessel, in order to liberate the steam. Into this vessel about fifty or sixty pounds of slaked lime is put, and some water; the steam is then let on, and the vessel covered at the top, and the boiling is kept up for ten or twelve hours. The tallow has now united with the lime, and is in a state of oleäte and steärate of that earth. The lime is to be saturated with sulphuric acid, by being boiled with it for some time. The steam is now stopped, and after allowing the oily matter to settle for some time, it floats, and the glycyrhine is at the bottom with the sulphate of lime,§ from which it is poured

* From the Greek words γλυκυς, sweet, and ῥιζα, a root.

† These are terms given by their discoverer, Chevreul, to the oily and hard crystalline matters produced by the saponification of fats and oils.

‡ Mostly Russia tallow, which is generally so offensive in odor, and so abundant in filth and putrid matter, that the mere idea of it is loathsome.

§ Our business here is not to give a minute detail of the process of making steärine, but

off, and any free sulphuric acid which it contains is carefully saturated by lime not in excess. The liquid is evaporated to the point when it assumes the appearance and consistence of sugar of about sevenpence per pound. It has a sweet taste; but it is needless to observe, that it is a worthless article, and obtained from a filthy and disgusting source. This is mixed with the sugar.

Now as the solubility of this substance in water does not differ from the sugar, it is not easy to separate them by an analysis; we would therefore advise persons, when they purchase sugar, in the first place to deal with the most respectable houses, and to choose that kind which has bright, shining crystals, resembling in size the red or coarse kind of sand. Generally speaking, sugar of a very small grain, of heavy, but dingy hue, crystalline appearance, is of bad quality, or of the "bastard" kind already mentioned. Sugar, on the contrary, which is mixed with glycyrhine is close, wet, and heavy, and has such a disposition to remain moist, that it clogs the sugar, and gives it the appearance of containing molasses. We think that our readers and the public will agree with us in the propriety of exposing such frauds as that we have related, and holding up their perpetrators to detestation.

From such atrocious cheats, not even the sacred obligations of religion are any protection; for we find that even among those who wear its outward garb, and are most assiduous and devout in their apparent duties, are equally, if not more guilty of them than the less sanctified portion of tradesmen. It seems so common a practice with them to adulterate every article in which they deal, that the following lines give a just view of their ordinary practice:—

"Have you sanded the sugar, good Sandy,
And watered the treacle with care;
Have you smuggled the element into the brandy?—
Yes, master.—Then come in to prayer."

ON THE MANUFACTURE OF SODA WATER.

BY MR. GRIFFITHS.

The object he had in view was to give a popular account of this beneficial liquid, which involves an acquaintance with both chemical and mechanical science. The materials required for its manufacture are pure water, carbonic acid gas, and carbonate of soda; which may be considered as the proximate elements of soda water. The ultimate elements are hydrogen, oxygen, carbon, and sodium.

Water was first considered.—It is never absolutely pure when found in nature. It may however be obtained in its purest form by the chemist *synthetically*, by mixing oxygen and hydrogen gases in the proper proportions, and passing an electrical spark through them in a Cavendish bottle, or other strong apparatus, as was first done by Sir H. Davy, in the laboratory of this institution. The process of distillation as invented by the alchemists is the mode employed to obtain water of sufficient purity for the purpose. The cheaper manufacturers do not however use it in this state, but are contented with drawing it from deep wells.

Carbonic Acid Gas has attracted considerable attention since the time of Dr. Black. It is principally procured by acting on carbonate of lime (marble, chalk, or whiting) with dilute sulphuric acid, when decomposition takes place: the sulphuric acid unites with the lime, and the carbonic acid passes off in the shape of gas. Water exerts a solvent power over it, giving to it a slight acid taste, and having the property of reddening vegetable blues, although but faintly. The gas is very soon dissipated from the fluid, even at the ordinary temperature of the atmosphere. This fugitive power of carbonic acid gas is further increased by heating.

Hales and Priestley discovered that by placing a vessel containing water into a jar containing carbonic acid, it imparted to the water a brisk and agreeable flavour; but it remained for Dr. Nooth to devise the means of obtaining it in a form suitable for a beverage. He constructed an apparatus composed of three vessels of glass, placed one above the other, and also in communication with each other, the upper two of which were filled with water, the gas as it is generated in the lower one, passes as fast as it is made through the water in the upper vessels, and is there partly absorbed. The superfluous gas is allowed to escape, and the impregnated water is drawn off as required. This apparatus was for some time to be seen on the side-board of dining rooms, and is occasionally met with at the present day.

In 1798, Mr. Pepys assisted Mr. Desvines in his experiments on the properties of carbonic acid gas and water, a description of which was given in the Philosophical Transactions of that year by the latter philosopher. Suffice it here to say, that the process is a very slow one. In 1800 Mr. Pepys con-

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a mere outline to enable our readers to understand the method of procuring the glycyrhine, or sweet matter of oils, as it was termed by Scheele.

* Lecture delivered at the Royal Institution, May 7, 1841, as given in the *Inventor's Advocate*.

structed an apparatus for condensing the gas in water, and in 1818 he obtained a strong aqueous infusion of carbonic acid by means of a machine, very similar to that now in use for the purpose. It consists of a vessel for generating the gas; this is connected by means of a tube to a condensing pump set in motion by a crank or fly-wheel, which pumps it into a glass vessel containing water, through a silver tube passing nearly to the bottom of the water. This glass vessel is enclosed in a copper vessel in case of accident. It is then drawn off and bottled; the bottles now used are the invention of Mr. HAMILTON.

Further particulars may be obtained by referring to the 4th Vol. of the Quarterly Journal of Science and Art.

SODA WATER of the best kind should contain a notable quantity of carbonate of soda; with the ordinary manufacturers this item is not attended to.

Mr. GRIFFITH was indebted to Mr. MAUGHAM for introducing him to Mr. WEBB, of Islington, who has devoted nearly half of his life to the manufacture of soda water, and who kindly gave Mr. G. every information and access to his factory. There are, however, many hundreds of manufactories, but Mr. WEBB's is considered to be on as large a scale as any. The ordinary manufacturers are contented with obtaining the water from deep wells and pumping carbonic acid into it. Mr. WEBB has a machine for aërating the distilled or condensed water, which he uses; this together with the other apparatus cost between 3,000*l.* and 4,000*l.*, while the apparatus used by ordinary makers may be obtained for 70*l.* or 80*l.* The water made use of by Mr. WEBB, is condensed by a ten-horse engine, and is pumped into a tank holding 4,600 gallons, to which carbonate of soda is added. It remains there for a fortnight before it is cold enough to work, and is then a weak solution of the carbonate of soda. This is then passed into a copper vessel, the interior of which is plated with silver, and is now ready for the reception of the gas, which is compressed into it by means of force pumps, the pressure being exerted until the valve indicates 70 lbs. on the square inch: it is then in a fit state for bottling.

The ordinary manufacturers formerly used to employ leaden vessels for the purpose; they now use slate of two inches thick for all the articles used in the process; even the gasometer, after the gas has been previously washed as recommended by Mr. PEPYS, is constructed of slate.

Cleanliness is a leading feature in this manufacture, and in order to prevent the oil used to lubricate the pistons of the force-pumps giving a flavor to the water, they are washed in both the up and down stroke by a jet of water. In washing the bottles, a revolving bottle brush is used with steam power; they are again washed and set to drain. The corks demand the greatest attention, inasmuch as they are found to contain many impurities which would materially tend to render the beverage unsaleable. They are cleansed in the following manner:—

About 150 gross of corks are placed in a wooden trough containing water (at the temperature of 80° Fahr.) with fifteen pounds of carbonate of soda dissolved in it. They are pressed down by means of a board, and allowed to remain there for about twelve hours; this entirely removes the extractive dark brown matter from the corks, which is drawn off, and the corks are then dried by steam. If this operation were not performed the soda water would abstract the extractive matter of the cork, rendering the beverage both colored and unpalatable.

The occupation of the bottler is one of considerable danger. The bottles are corked through a brick wall, and he is, in addition, furnished with a thick leather apron padded in front about the chest. The face is protected by a wire mask, and the hands also are covered. The bottle is placed on a little stand, which rising by means of a lever to the tube, opens a valve. The cock is then turned, and the elasticity of the gas drives it into the bottle. He then has a cork handed to him by a boy, also similarly protected, which is put into the bottle, and is beaten in by means of a wooden flogger; this is the most dangerous part of the process. As soon as the cork is fairly in, the bottle is handed to a boy, who takes it in a piece of strong leather, and ties it down with string and wire. If the bottle be too thin to withstand the pressure, it bursts, and severely wounds the workmen, provided they are unprotected. The average quantity that break in one day at Mr. WEBB's factory, when in full work is about twelve dozen. After it is corked, there is a pressure of about three atmospheres in the bottles.

He then alluded to the properties of carbonic acid in detail as connected with the subject, and explained the process of fermentation, &c. Towards the close of the lecture, *solid carbonic acid* was prepared, and mercury was frozen by mixing ether with it.

METHOD OF OBTAINING A PHOTOGENIC COPY OF A PRINT BY ONE EXPOSURE TO THE SUN.

BY T. W. NAYLOR.

IT is well known that the ordinary photogenic fac-similes of an engraved print pos-

sess very little sharpness; the lights and shades appearing to mingle with each other, giving the whole picture a dull hazy appearance. This, it will be remembered, is principally owing to the second transference, which is at present always practised, and which it is my object to dispense with altogether. After many trials and experiments, I at last hit upon the following method, which I have repeated a great number of times, and, to my satisfaction, it always fully answered my expectations.

The engraving of which you are desirous of obtaining photogenic copies is to be printed on thin paper, and instead of using the ordinary printing-ink, the following mixture must be used:

White wax . .	1 oz.
Canada balsam .	2 oz.
Copal varnish .	1 oz.

This is the composition I used, but any oily varnish will nearly answer the same purpose.

In order that the mixture may penetrate quite through the paper, the plate must be printed very hot and with a rather tighter pressure than usual. After it comes from the press, steep the impression several times in strong writing-ink until the parts untouched by the printing mixture appears totally impervious to the light. The appearance of the print is now very different from that of one obtained by the printer in the usual manner: the lines of the former being white and transparent, and the rest of the picture quite black and opaque, while those of the latter are black and on white paper as usual.

Having now possessed yourself of an impression prepared as above, you may obtain with the assistance of a sheet of photogenic paper, by only one exposure to the bright sunlight, an exact copy of the print, having the lines formed of the dark tint exactly the same as in an ordinary print. It must now be fixed in the usual manner, and the process is completed.*

Photogenic pictures, procured in the above manner, must necessarily possess great distinctness and clearness of outline, compared with those which have gone through the operation of re-transferring, which never fails to render them obscure and spiritless.

* The prepared print will serve for an almost infinite number of times.

III. PHARMACY, &c.

MEDICAL REFORM AS RELATES TO DRUGGISTS.

We had hoped that the course adopted by the Committee of the Pharmaceutical Society lately established, by which it is intended, that all who are about to be initiated into the business of chemists and druggists should receive a suitable education, and undergo an examination as to their qualifications, would have put an end to the eternal cackling of the apothecaries about the "invasion of their rights," by those whom they term "ignorant impostors and pretenders,"—*i. e.*, chemists. We are, however, satisfied that they are still at their work, both in private and in public, not only in scribbling in their *oracle*, but also in setting in motion the wonder-working association of old women who occasionally delight Exeter Hall with their oratory and wisdom.

Even from the very first exhibition of their intentions to ruin this large and respectable body, chemists had but little to fear; but now they have nothing, so long as they use due vigilance, and do not rest satisfied until they have fully carried out the objects set forth in their prospectus, and which were proposed at the late meeting at the Crown and Anchor. No one can deny the necessity of "medical reform," *i. e.* medical improvement; still it is not to be obtained by depriving the chemist of the privileges which belong to his business; but more especially by preventing all apothecaries from exercising the art of surgery unless duly educated and qualified,—by enforcing much severer study and more rigid examination in each distinct branch of science,—and by suppressing quackery in all its forms, as well in the profession as out of it, by far the largest portion existing there. Let only any one of common decency peruse the immoral, filthy, and disgusting advertisements which daily sully the minds of the youth of both sexes, with expressions too execrable for any other pen but that of the wretches who make the vices of man-

kind the subjects of their frauds.* The whole abandoned herd of Eadies, Gosses, Jordans, &c., have too long been suffered with impunity to carry on their lying and filthy abominations. It is to be hoped that not only the whole profession, but every well-wisher to the community, will exert his influence to put a finishing stroke to this nuisance. If patent medicines are to be suffered, in order to eke out the revenue, let such medicines be properly examined, and their composition duly specified and enrolled in the Patent Office, and let none but such be sold.

Of the many schemes of medical reform which we have seen, none are calculated either to give satisfaction or to put the different branches of the profession on a respectable basis. Each class has its particular views, and such as have come to our notice are most beautifully calculated to benefit that branch whence they originate, and to show that the old maxim of "taking care of number one" has been strictly adhered to.

It is our intention shortly to lay before our readers the present state of the medical profession as contrasted with what it ought to be: we shall then show that those corporate bodies who have hitherto been entrusted with the regulation of the different grades of practitioners, and the examination of their qualifications, have so neglected their duty, and studied merely to advance their own interests, that they have become a by-word of contempt to medical men and the public, and their colleges are now no more valued than the halls of the merchant tailors or of the fishmongers.

ADULTERATION OF CONFECTIO SENNÆ.

To the Editors of The Chemist.

Edinburgh, May 18, 1841.

GENTLEMEN:—

Aware of your anxious desire to expose the adulterations of drugs, which have lately become so very common, I would take the liberty to draw your attention and that of your readers to the usual mode of preparation followed to produce the confectio sennæ, than which there are few compounds better adapted (when properly made) for exhibition either of powerful medicines, or some of the milder and more gentle aperiants. Few pharmaceutical preparations afford greater facility for the mixing of extraneous matter without the fear of detection than this one. Nay, from the composition of the electuary, it would be well nigh impossible, even by analysis, to detect its impurities; hence the only criterion by which we can judge of its purity is the effect produced upon the constitution. I have had occasion to draw your attention in a former instance to the subject of adulteration generally, and most sincerely do I hope that your own strenuous exertions to drag the hidden monster from his concealment may be crowned with success, and receive the thanks of every conscientious chemist in the United Kingdom.

In producing the spurious article, a little ingenuity is displayed in the endeavour to render it in appearance like the genuine. For this purpose various articles are employed; and for the sake of illustration, I will subjoin a formula, by which one of the largest provincial wholesale houses was in the habit of preparing the confect. sennæ,—and this I believe to be one of the best.

℞ Prunes and Figs, 4lb. Fruct Tamarind. 3lb. P. Fol. Sennæ, 2lb. P. Coriand. 1lb. Sacch. Alb. Com. 14ʒ. Ipecac. 16ʒ. Pulv. Jalapæ, ʒx.

But if proof were wanting regarding the impurity of confect. sennæ as usually sold, we have only to make a calculation of the absolute cost of the preparation, which we will find to come to somewhere about 1s. 9d. per lb., while many houses are vending what they have the hardihood to mark—"Conf. Sennæ. Ver." at 9d. per lb. My attention was strikingly drawn to this subject by a medical gentleman stating that there was very great difference in the effects of confect. sennæ, procured from various shops, upon the same individual.

The patient to which he referred was a female in delicate health, of a costive habit, but so delicate, that any medicine of a resinous description, brought on a violent attack of diarrhœa. He tried various remedies, but nothing answered so well as genuine conf. sennæ, and sometimes a little rhubarb. I have always attended particularly to this compound, but find that it has got not a little into disrepute, for which I think we have what are technically called the improvers to thank; who have devoted much time and labor to the reduction of quality and price. What, I would ask, can be more vexatious both to practitioner and patient, than to find the drastic effects from a resinous purge like jalap, taking the place of the mild and aperient character of the senna and other ingredients? Dr. Paris, in his Pharmacologia,

* We wonder that the Society for the Suppression of Vice does not interfere; it often does, where it is not wanted.

when speaking of the confectio sennæ, says—"the directions of the pharmacopœia are, however, rarely followed; jalap blackened with walnut liquor, is frequently substituted for the more expensive 'article cassia.'" And again, the same author states,—"I understand that a considerable quantity is also manufactured in Staffordshire, into which unsound and spoilt apples enter as a principal ingredient."

I need say no more to convince all who take an interest in the matter, for they have it in their power to test its virtues; but before closing this short epistle, I would impress upon the minds of my brethren in trade, the necessity of preparing, not only this but all other pharmaceutical substances which they possibly can. It may occupy more time, and be done at greater expense, but neither will be ultimately lost to them; for they may rest assured, that the time is now rapidly approaching, when the abusive system at present followed will be overthrown, and its votaries exposed. Adulteration is at its maximum, and we may safely calculate, now, that we have the prospect of the Chemists forming themselves into a corporate body to protect the hitherto neglected members of our trade, to find scientific and clever men starting up on what has long been considered as barren and unproductive soil.

I remain, Gentlemen,
Your most obedient servant,
J. M.

MEDICAL REFORM AS AFFECTS DRUGGISTS.

LETTER III.

To the Editors of The Chemist.

GENTLEMEN:—Whether the discussion of Medical Reform in the House of Commons will be brought on before the Corn-law measure, I must leave for politicians to decide. There is a question, however, which may be better answered by the readers of your journal; and the question is,—Are the chemists and druggists now exerting themselves in a ratio with the exigency of the times? When danger first appeared, and events assumed a threatening aspect, they all at once became alarmed, and in great haste called one another together; now that the danger is presumed to have past, the fear has subsided, and zeal is fast mouldering into indifference.

The energy and excitement of the druggists at the first meeting held at the Crown and Anchor Tavern was such, as to be the subject of much remark among the medical journals: nay, it had a mighty influence, as we know, upon the "reformers" themselves. The second meeting formed a singular contrast to the first, and was most remarkable for the zeal which was *not* displayed. The recommendation of the worthy and excellent chairman, at the opening of his speech, to preserve "calmness" in any debate which might ensue, was rather amusing, when compared with the subsequent feeling and tone of the meeting. Impetuosity certainly was not the order of the day; and I fear whether the "calmness" so faithfully preserved was not the result rather of apathy than of discretion.

Among those individuals with whom I have conversed, there seems to be an impression that medical reform will come to nothing, and therefore that nothing need be done on the part of the drug trade. Such sudden change from alarm to over-confidence, is not, I think, the part of a firm and prudent mind; and what grand assurance of security, with respect to the chemists and druggists will justify this sudden change? The seedling of "Medical Reform," although earthed over for a little while, by the dust of ministerial breezes, needs only a few genial showers, perhaps, to shoot into a sturdy plant. Then, as to the "views" of the government, (if still holding on) by way of opposition to the question, I do not know that much reliance can be placed upon that. Let those who have studied the movements of the weathercock in the month of March, calculate the phases of whig politics in the future tense. Mr. HAWES and his colleagues have been a good deal taunted by the newspaper press with presumption on the one hand, and fear and imbecility on the other. Lord J. RUSSELL has also had the misfortune to be left in various disgraceful minorities. Is it quite certain that "Medical Reform," (like other legislative items) will be too large a price to pay for the purchase of some dozen or score of votes at a hard push?—of the votes of those men who are leagued to wage vehement war against the chemists and druggists?

Not very long ago the honorable Editor of THE LANCET, was seen to be a virulent abuser and opponent of the ministry; so much so as to lead the usually meek and temperate LORD JOHN RUSSELL, into expressions of considerable warmth. Behold him now simpering to the noble Lord in all the *suaviter* of the sugar question—appealing to the medical public on the nutritive properties of sugar, and the philanthropy of relieving the poor man to the amount of six-tenths of a farthing per lb. duty on that useful commodity! Such incidents may be regarded only as straws; still, like straws thrown up, they serve to shew how the wind blows. Druggists may, perhaps, be captivated with the idea of an extra penny-worth of profit per gross on their lemonade and ginger-beer powders, or a penny per

lb. reduction on oxalic acid, and other manufactures of sugar; but would they be glad to pocket such enormous liberality if at the price of a "medical reform" monopoly? I mention this merely as a small matter for reflection, and to suggest that the eye of caution must be kept awake, as well as an unremitting activity exercised.

The first and grand point will be the efficient organization of the Society of Chemists and Druggists, called the Pharmaceutical Society. The committee, as I have once before stated, has very considerable claims upon the confidence and gratitude of the trade at large. It is composed chiefly of the wholesale druggists—men who have no direct advantage to themselves in the work in which they are engaged. Their exertions, I conceive, are honestly devoted to the general interest and welfare of the retail trade throughout the empire. For the latter, therefore, to withhold assistance and co-operation, under such circumstances, would be the extreme of supineness, stupidity, and ingratitude. It is by the suggestions they receive that the committee are mainly directed in framing such measures as may seem at present to be called for. No individual in the trade should imagine himself too insignificant to help, by his advice or counsel in such a matter, nor will any suggestion, I am confident, that may be offered, fail to be received with respect and kindness by the Committee.

The business of enrolment, which of course is the first thing to be done, has many impediments from the difficulty found by the committee in obtaining the names of chemists living in remote parts, in order to correspond with them. But fancy this difficulty increased by many not sparing the time, or having the inclination to forward their names for enrolment, after having been solicited so to do! I felt perfectly ashamed to hear many of the druggists at the last meeting refuse to put their names to the resolution for forming a pharmaceutical society, because "they did not know what they were going to sign!"

I would suggest that the Committee should appoint and announce some early day when they will publish the names of all those who have left or forwarded their names for enrolment.

I have also to propose, and would particularly recommend as a standing law of the Society, that no person should be eligible to enrol his name, or whose name being enrolled, eligible to remain a member, who makes it a part of his regular business *to visit patients out of doors;* and in the case of any member so visiting patients in time to come, that his name be forthwith struck from the rolls of the Society.

Such a regulation, I think, would not only be *practicable*, but would better define that line and barrier which has been sanctioned by custom, and seems marked out by the nature of things. And while it would show to the medical profession that the druggists are desirous of keeping up a due restriction and distinction between the drug trade and the profession of physic, it would imply, at the same time, that they will still reserve to themselves the right of practising whatever *they* consider to be proper, beneficial, and lawful, within their own house and castle.

I am, gentlemen, your obedient servant,

W. G.

MEETING OF DRUGGISTS AT WOLVERHAMPTON.

To the Editors of The Chemist.

Wolverhampton, May 14, 1841.

GENTLEMEN:—

I take the liberty of forwarding you a copy of the proceedings of our late meeting, and to request the insertion of the same in your valuable publication, "THE CHEMIST," hoping that this and other meetings, which have been held in various towns in England, may be the means of stirring up the members of the trade generally, to be alive to the necessity of co-operation in protecting their established privileges.

I remain, Gentlemen,

Your obedient servant,

J. F. SEYDE.

At a Meeting of the Chemists and Druggists of Wolverhampton, held at Mr. Fleeming's, High-Green, April 27, 1841, John Weaver, Esq., in the Chair, it was

First—Moved by Mr. J. F. Seyde, seconded by Mr. Gow, and resolved—

That the thanks of this meeting be given to the Committee of Chemists and Druggists in London, for their spirited and efficient opposition to the obnoxious bill of Mr. Hawes, which threatened interference with their existing privileges.

Second—Moved by Mr. Jackson, seconded by Mr. Ford, and resolved—

That a Committee be formed of the Chemists and Druggists in Wolverhampton, and that John Weaver, Esq., be requested to act as Chairman, and Mr. J. F. Seyde as Secretary.

Third—Moved by Mr. Fleeming, seconded by Mr. Griffiths, and resolved—

That a subscription be immediately entered into, and that a part of the amount be remitted to the Treasurer of the London Committee.

Fourth—Moved by Mr. Bailey, seconded by Mr. Alexander, and resolved—

That this meeting views with great satisfaction the proceedings of the London Committee, and pledges itself to co-operate with them in any measures they may adopt for the protection of the interests of the trade.

Fifth—Moved by Mr. H. Gibbons, seconded by Mr. W. H. Lowe, and resolved—

That this meeting, being of opinion that the Chemists and Druggists are capable of self-government, hails with pleasure the proposition of the London Committee for the formation of a society to be called the "Pharmaceutical Society of Great Britain," having for its object the union of the members of the trade into one body—the protection of their rights—and the improvement and advancement of scientific knowledge.

Sixth—Moved by Mr. R. Fowke, seconded by Mr. Banks, and resolved—

That the proceedings of this meeting be published in the two Wolverhampton papers, and forwarded by circular to the Druggists in the neighbourhood, requesting their co-operation.

Seventh—Moved by Mr. Sutton, seconded by Mr. Gorton, and resolved—

That the thanks of this meeting be given to the Chairman for his efficient services, to whom all communications are requested to be forwarded.

(Signed)

JOHN WEAVER, Chairman.

At the close of the meeting a subscription was entered into.

APOTHECARIES AND DISPENSING CHEMISTS.

To the Editors of The Chemist.

High-street, Bognor, 10th May, 1841.

GENTLEMEN:—Every well discerning man must retain a deep sense of gratitude towards the Metropolitan Committee of the chemists and druggists, for their unceasing exertions in the present struggle to cast off the yoke of oppression and fetters of prejudice and ignorance, which have hitherto been placed upon themselves and brethren by the several corporate bodies of medical practitioners, as also towards yourselves for the persevering and zealous course which you have pursued, in upholding and asserting the rights of the worthy members of our community, as well as discouraging and exposing the abuses and faults existing among others in their professional and scientific practice; at the same time, urging all, and the latter especially, to adopt such correct and creditably devised plan for their future line of conduct, as has already appeared in the columns of your valuable journal. Being impressed with this feeling, I am induced, after the encouragement you gave me by inserting my letter in No. 17, to write a few more lines, not only for the readers of *The Chemist* to consider upon, but every medical man also.

It has been a matter of surprise generally, I think, that so little notice should have been taken by the medical practitioners, of every department, relative to the clause in Mr. Hawes' Bill and according to Mr. Munts, "that all prescriptions be written in English, and that all bottles, &c. be labelled in a similar manner." Is not every prescriber of medicine on the *qui vive*, as to whether such an *absurdity* will ever become a law? Would that the minds and talents of the many gentlemen composing the different bodies, were neither misdirected, nor misapplied, and that, instead of viewing one another with envious and avaricious eyes, they studied to assist and uphold each other, in their several positions in life, thereby gaining the respect, confidence, and support of the public, and being enabled to oppose *effectually* that, which, if once allowed to come into operation, will too surely be a death-blow to the physicians, and a ruin to the profession "in toto." I trust that so deplorable a state of things may *not* be allowed to continue much longer; that all may be alive to their own interests, perceiving that in *unity* lies their *strength* and power to crush, at their very birth, these trumpery abuses which are now being introduced.

If not out of place, I will mention a fact, showing the *erroneous* ideas entertained by these gentlemen, which can only create a feeling of pity and regret that they should be so blinded by prejudice, and a laugh at the thought of their holding up a picture intended as a representation of ourselves, and which, when reason approaches, is clearly proved to be no more than a mirror, in which themselves are faithfully depicted. A surgeon, a friend of mine, after reviling your publication, *The Chemist*, in a letter, proceeds thus: "I signed a petition, praying the extermination of such vipers, as the chemist and druggist. How could the Government or the public allow themselves to be bamboozled so long? A friend of mine, in the same profession as myself, visited the chamber of sickness, in which a lovely relict of what had once been most lovely lay: she had been accustomed to seek the advice of a reptile (druggist), whose kind attention had brought her to the state she was then in. The slightest examination of the medicine was sufficient to show him the dreadful effects of drugs, when applied by inexperienced hands. I need not add that skill

soon snatched her from the yawning gulph of death to which ignorance had brought her. How can these things be suffered to exist? How can the eyes of the poor be suffered to remain blinded by ingenious imposition, more cunning than priestcraft, and more fatal to disease, than neglect itself?" I would only kindly remind my friend, should this meet his eye, in the words of Lord Bacon, that, "discretion in speech is more than eloquence."

At the present time, if a chemist and druggist attends a patient, and a second opinion is required, what follows? The "man of knowledge" does not think what he would have done in the chemist's place, but often gains a first knowledge of the disease himself from the prior treatment of the case, which perhaps enables him to restore the patient, and consequently gains him credit for being very clever. Such is the real truth; but put any question, and be assured you will meet with a reply similar to the words above quoted. Again, suppose a patient dies under the hands of a chemist and druggist, what is the result? A strict investigation is absolutely necessary; but, I say, reverse it, and let it be a medical practitioner's case. Is it asked under what circumstances the person died,—whether proper remedies were applied,—if the nature of the complaint, or the effects of the medicines administered were properly understood? Certainly not,—because they have licences to protect them, and their fellow members' support. Let *us* become a corporate body of ourselves, having examinations and licences, with a discriminating and impartial public for our judges; then shall we fear *none*, knowing that each will find his own level, that the intellectual and scientific man will be acknowledged and supported by all, and that he who carries his brains in his pocket, will be treated and looked upon as *such*. By inserting this in your valuable journal, if worthy, you will oblige,

Gentlemen,
Yours, very respectfully,
ALFRED WATTS.

PRESCRIPTION WRITING.

To the Editors of The Chemist.

GENTLEMEN:—

In your remarks on Medical Reform, in No. XVI. of THE CHEMIST, speaking of Physicians, you observe that—"it is to be regretted, that instead of writing prescriptions in the very worst Latin, they are not contented with plain English." I must say, I do not entirely agree with you; I am quite sure, that in many instances the mind is the great ruling influence, and that a prescription written in English would be subjected to a canvass by the patient, in nine cases out of ten to a disadvantage, as, not knowing how simple a remedy is frequently of the greatest service, they would be led to despise the means of cure; but I do think that the general illegibility and the striving after the scientific names are evils to be complained of and which ought to be remedied. I really think, with all due reference to the Faculty, that among other studies, the art of writing in a plain legible style should not be neglected; many prescriptions that have come in my way in the last twenty-five years, have been merely guess work.

I am, Gentlemen,
Your constant Reader,
A CHEMIST AND DRUGGIST,
A. Z.

HOMŒOPATHY.—REPLY TO MR. YOUNG.

BY MR. P. H. HARPER.

To the Editors of The Chemist.

Henley in Arden, May 14, 1841.

GENTLEMEN:—I should be obliged by your inserting the following few remarks in answer to Mr. Young's last paper on Homœopathy, in the following number of your excellent journal. They are the last I shall trouble you with on that subject.

I am, Gentlemen,
Your obedient servant,
P. H. HARPER.

It is very evident that Mr. Young has studied his favourite science of homœopathy to the exclusion of every other branch of medicine. Not know what Brownism is! Not know that his principles made quite as much noise in the medical world at the time they were first promulgated as homœopathy is at present doing. Mr. Young evidently is very ignorant of the first principles of medicine, and of every revolution that has taken place in the general principles of medicine.

Does Mr. Young think that because certain proselytes to any science are able to write M.D. or M.R.C.S. after their names, it increases the value of that science, or converts any greater number of self-thinking men to its dogmatical tenets? I can assure him, No.

With respect to the effect of medicines on the healthy subject: Andral took quinine in the doses recommended by Hahnemann for the time recommended by him, and with every care, attention to, and strict observance of the regimen likewise directed by him, and yet never was able to induce symptoms resembling ague. Was Andral blessed with a happy idiosyncracy against that disease? What says Mr. Young!

It is still more evident that Mr. Young knows nothing of the doctrine of allopathy, or else he would know that there is such a disease as spontaneous salivation, and therefore whatever honour he may wish to give me for having described some new disease, I will freely give it him all back again, and assure him that I have only described a disease which every practitioner sees almost daily. Mr. Young next wishes to know why I do not embrace homœopathy? What! am I to prostrate my reason and my judgment to the shrine of demonstrably absurd doctrines, and in spite of every sense of reason or of feeling, try experiments on the health and lives of my fellow-men? Am I to give the decillionth of a grain of arsenic in peritonitis? Am I to give cantharides in inflammation of the neck of the bladder? Am I to give mercury in spontaneous salivation? Eh, Mr. Young? "God help," say I, "those patients getting under such a mode of treatment."

With respect to the development of electricity in their minute globules, I again say, that it is impossible that it can be retained even were it developed; but it is impossible that it can be developed during the amount of trituration given in preparing their medicines. Hear what Hahnemann himself says as to the amount of trituration required: "I have been forced to prescribe the number of shakes to two, of which I formerly described ten in each dilution;" (Organ.) And in dissolving a solid in water, we are told to move the phial "*circa axin suum*," and at each alternation to shake it twice, "*bis, brachio quidem bis moto, concute.*"* Therefore I say it is impossible to develope electricity in such minute shakes. With respect to its curing disease, I said before, and say again, that it is only capable of curing those diseases which would get well equally fast if left to themselves.

Perhaps Mr. Young does not know that homœopathy was fairly put to the test of experiment by some of the members of the Académie de Medécine, and that the result was a failure, and that one of the first pathologists in Europe (Andral) tried it on 130 or 140 patients, taken without any choice or care from the wards of the hospital, in the presence of the homœopathists themselves, and treated with every possible regard to the homœopathic regimen and medicine, and yet not in one case was he successful.

Finally: let me say, I have only come to the conclusions mentioned in this and my former paper, in consequence of finding every portion of this doctrine so absurd and so untenable, as well as altogether inconclusive as to its own professed end.

I am, Gentlemen,
Your obedient servant,
P. H. Harper.

* See Dr. Quin's *Pharmacopœia Homœopathica.*

EXPERIMENTS ON POISONING BY ARSENIC: MADE BEFORE THE ROYAL ACADEMY OF MEDICINE, PARIS.

BY M. ORFILA.

(Concluded from No. XVII.)

FOURTH SITTING; NOVEMBER 2, 1840.

The sitting commenced at ten o'clock.

The minutes of the last sitting having been read by M. Orfila, and having been pronounced correct, were signed by the members of the commission.

The two dogs poisoned on the 28th of October—one by ten centigrammes of arsenious acid, and the other, by the same quantity of stibial tartar, were taken; both animals, as we said in our last, had made water in a considerable quantity, and were cured. About 130 grammes of urine were obtained from the dog that had been poisoned by arsenic, and 40 grammes from the other. These two liquids were evaporated in two new porcelain capsules, after having been mixed with ten centigrammes of alcoholate of potassa; the dried product was torrified, at a moderate heat, being kept stirred until it acquired the color of burnt coffee. The residue furnished by the urine of the dog poisoned by arsenic was boiled in distilled water for ten minutes, and that from the dog poisoned by tartar emetic was boiled for a quarter of an hour in pure concentrated hydrochloric acid. The two liquids being filtered and introduced into two of Marsh's apparatus, previously tested, one furnished arsenical, and the other antimonial stains.

The urine of the dog poisoned by arsenic, and collected on the 31st of October, four days after the poisoning, subjected to the same operation, also gave arsenic. The urine which had been passed by the dog poisoned by tartaric emetic on the 29th of October, the day after the poisoning, treated in the same way, immediately yielded antimony. The liver of these animals, dried, and carbonised by pure concentrated nitric acid, left two carbons which were boiled for twenty-five minutes with distilled water: the filtered liquids, put into two of Marsh's apparatus, gave no traces of either arsenic or antimony, even after a trial of half an hour.

About 120 grammes of urine passed on the 1st of November, by a woman labouring under cutaneous disease, attended by Dr. Emery, were subjected to the same chemical operations, and arsenical stains were imme-

diately obtained. This woman took every day, for more than six weeks, very small doses of Fowler's drops, a compound of potassa and arsenious acid. Antimony was obtained by the same means from two samples of urine sent by Dr. Bouvier, passed by a woman labouring under pneumonia, to whom that physician has administered at one time 20, and at another, 30 centigrammes of stibial tartar.

"It is the same, therefore, with man as with animals," said M. Orfila. "You see that in both cases, the arsenical and antimonial matters, introduced into the stomach, are eliminated with the urine. We have already proved this fact on the urine of several patients attended by MM. Dumeril, Hassen and Bouvier. We have also seen that the liver of two persons who died after the administration of two strong doses of emetic, contained appreciable quantities of antimony.

"I would most seriously call the attention of the meeting to the medico-legal consequences which flow from these facts. The experiments which you have witnessed incontrovertibly prove that if we had hung the two dogs poisoned on the 28th of October a few hours, or a few days, after the poisoning, we might have extracted arsenic and antimony from the liver and other viscera of those animals. Now, on the sixth day after the poisoning, we cannot detect an atom of either of those metals in the above-named viscera, but the urine passed by those animals from the 28th until to-day contains arsenic and antimony. It might happen, therefore, that an individual might die poisoned by one or other of these poisons, and that they would not be detected in the liver, the spleen, the heart, &c., because the person had lived several days after the poisoning, and because all that had been absorbed had been eliminated by the urine, and perhaps by other ways. You see how one might be deceived, if one said that the two dogs to whose thighs the arsenious acid and stibial tartar had been applied, on the 28th of October, had not been poisoned, because only six days after the poisoning, the existence of arsenic and antimony was not detected in the liver, spleen, &c.!!! I do not mean to say that the organs always are freed, on the sixth day, from the absorbed poisons; for there are great differences, according to constitutions, the dose of the poison, and the quantity of urine passed in the first days of the poisoning."

M. Orfila then showed the two dogs whose œsophagus had been tied on the 29th of October, and which was perfectly cured. Of the five animals poisoned the evening before by 25 centigrammes of arsenious acid dissolved in water, by 50 centigrammes and by 1 gramme of the same poison pulverised, 4 had completely recovered. The fifth, which was very well three hours after being poisoned, died on the spot at one o'clock the day before, because the warm water with which he was injected, instead of going into the stomach, went into the tracheal artery; death occurred from suffocation, as shown on opening the body in the presence of the members of the commission. The four dogs which were cured vomited several times, and were treated only by warm water, except two, which were bled at half-past one. One lost 125 grammes of blood, and the other 270.

The dog to which the tonic excitant medicine was administered at half-past ten o'clock yesterday morning, died at half-past six o'clock in the afternoon.

At a quarter-past ten, 25 centigrammes of arsenious acid were introduced into the stomach of two dogs, and the œsophagus was tied. At a quarter-past eleven, the ligature was detached: a mixture of 128 grammes of broth, 32 grammes of brandy, as much wine, and 15 drops of Sydenham's laudanum, was injected. This injection was repeated at one o'clock, at three, and at half-past five. One of these animals died at six o'clock, although it had vomited considerably since noon; the other died at a quarter-past seven; the latter was very robust, and much stronger than the other.

These experiments, said M. Orfila, naturally lead me to speak of the treatment of poisoning by arsenical preparations.

After some considerations on the manner in which poisons act, M. Orfila said that a physician called in to a case of poisoning should commence by evacuating the patient both upwards and downwards, in order to remove from the digestive canal the portion of poison which has not yet acted: if this were not done, it would exert a prejudicial action, and every minute the symptoms would be aggravated. Warm water, emetics, and mild purgatives, almost always are successful. With certain poisons, such as those which may be instantly decomposed in the digestive canal, being converted into an insoluble and inert matter, antidotes and counterpoisons are employed with advantage, emetics and purgatives being afterwards used for removing the poison which has not been decomposed, and also that which has. Thus, in cases of poisoning by the salts of lead or baryta, a few grammes of sulphate of potassa or soda, taken into the stomach, are sufficient to immediately convert those poisons into sulphate of lead or baryta, both of which are insoluble and inert. In certain cases, recourse is had to liquids, which possesses the property at once of neutralizing the poisonous substance, and of expelling it from the diges-

tive canal, such as white of egg in warm water, in cases of poisoning by the salts of mercury and copper (corrosive sublimate, verdigris).

However, we must not stop here: part of the poison swallowed is already absorbed and carried with the blood into the different organs: it is this portion that occasions such fatality, and unfortunately emetics and purgatives have not the power of expelling it, not having any hold over them. This portion causes a more or less serious disease, which must be attacked without delay, sometimes by bleeding and emollients, if it is inflammatory; sometimes by narcotics, sometimes by excitants, and, in my opinion, most frequently by diuretics, combined with one or other of the means of which I speak. Let us dwell for a moment on the advantages of diuretic treatment.

It has been proved that in most cases the poisonous substance is absorbed, and passed into all the fibres of the body, where it remains for a long time, and from which it is expelled, if not entirely, at least in considerable quantity, by the urine. Common sense points out that it is useful to promote the secretion of urine, in order to remove, continually, and in small quantities, the poisonous substance from the fibres, which ultimately kills the patient, unless the physician masters it. Now, the very numerous experiments tried on animals confirm the justice of this reasoning, by proving that all the dogs which were poisoned by sufficient quantities of arsenious acid and tartar emetic to have killed them in from 20 to 40 hours, were quickly cured, if made to pass urine freely, by means of a diuretic composed of five quarts of water, a quart of white wine, a bottle of selzer water, and from 60 to 80 grammes of nitrate of potassa, given each time in the dose of one or two glasses.

Afterwards passing to the treatment of poisoning by arsenious acid, M. Orfila said, that there existed no antidote for that poison. Hydrosulphuric acid, the alkaline sulphurets, carbon, lime water, &c., so much cried up, were powerless, and often dangerous. The hydrated peroxide of iron, in his opinion, ought not again to be employed, because it required to be administered in such large doses,—because, on account of its insolubility, it combined only very slowly with the arsenious acid,—because it often contains arsenic, and because it is often more advantageous to promote vomiting and stools, and to expel the arsenical matters contained in the digestive canal, either by means of warm water taken in large quantities, or by aid of emetics and mild purgatives. By these means, we are certain that persons poisoned by arsenious acid will evacuate above and below, if not all, at least a considerable quantity of that poison.

What mode of treatment should be employed against the disease caused by the arsenious acid which is absorbed? Three modes of treatment present themselves: the antiphlogistic and emollient; the treatment by tonic medicines; and the treatment by diuretics.

The antiphlogistic method, which has been in favour from time immemorial, has been very successful with man. Bleeding in cases where there was an evident reaction, when the skin was hot, the pulse strong and frequent, and when there were or were not pustules on some parts of the body, delirium, &c., has been of incontestable utility. I have used this means, with success, twenty-one times. In some of the English medical journals, it is stated that out of nineteen cases of poisoning by arsenic, which occurred within a few years, eighteen were cured after bleeding. Dr. Schedel, who carefully noted the exaggerated effects of the arsenical medicines so often administered at the hospital of St. Louis, does not hesitate to pronounce in favour of bleeding and against tonics, for calming the irritation caused by that treatment; the experience which he gained in this respect, while with Dr. Biett, one of the most distinguished physicians, leaves no doubt on this subject. And what is opposed to such numerous and well attested facts? A few experiments on dogs, to which large doses of arsenical poison had been administered, and which died after being bled. But these experiments have been so badly performed, and so ill described, that they cannot be regarded as conclusive: the animals had not swallowed a drop of water or any other liquid calculated to promote vomiting; the bleeding was often practised a short time after the poisoning, thus facilitating absorption, &c. In the facts which you have witnessed, and which I would have multiplied, if we had time, the animals poisoned and bled have been cured; not that I mean to say that they owe their health entirely to the bleeding, since they have vomited, and vomiting has been promoted by the injection of warm water: but the bleeding has not prevented them from being cured. In conclusion, the physician ought to bleed in cases of poisoning by arsenious acid, and to administer emollients every time that there are evident symptoms of reaction.

Rasori was the first who pointed out the tonic excitant treatment as being best adapted for cure in cases of poisoning by arsenious acid: according to him, this poison acts as an asthenic, or weakening one; it must be opposed by tonics and excitants. Do cases exist in which men have been restored by this treatment? I do not know a single authentic case of it. On what then do they rely? On a few experi-

ments tried on dogs. Eleven of these animals out of nineteen poisoned by arsenious acid, were cured by the administration of tonics. I accept these facts, but they prove nothing in favor of the system, for all the animals which were cured had vomited abundantly, and we know that they would have been cured quite as well if they had been caused to vomit by the exhibition of warm water. Surely it cannot be said that this liquid acts as an excitant. Again, have you not just seen two dogs poisoned by twenty-five centigrammes of arsenious acid in solution, die in the space of a few hours, although treated in the above manner? To prevent cure, it is sufficient to prevent vomiting for the first hour after poisoning, by tying the œsophagus. Tonics, therefore, have not been sufficiently established as antidotes in all the cases in which they have been given to dogs that have not vomited during the first hour; and if, indeed, they have been successful, it is because the animals had vomited before they were given, because they promoted fresh vomiting, or because they favored the secretion of urine. The physician ought, therefore, to renounce this mode of treatment, which, in addition to its inutility, may also present the disadvantage of producing intoxication, for small as the dose is that is employed, it is said to act efficaciously.

I have a few words to add to what I have already said relative to the advantages of the diuretic treatment. It is inoffensive, rational, and attended with success when the quantity of urine is considerably augmented. However, it has not yet been employed on man. Every thing induces us to believe that its effects would not be different on the human species to what it is on dogs, since in man also the organs abandon the arsenious acid absorbed, and it is eliminated with the urine. In conclusion, I will engage with the members of this commission, who may not be sufficiently edified by what I have shown them, to repeat to them, if they wish it, any of the experiments already made, and even to try new ones.

The sitting terminated at half-past four.

NEW METHOD OF PREPARING THE UNGUENTUM HYDRARGYRI NITRATIS; WITH REMARKS ON UNGUENTUM HYDRARGYRI.

Penzance, May 5, 1841.

Gentlemen:—Seeing in some recent numbers of *The Chemist*, prescriptions for preparing the Ung. Hydrarg. Nitrat. I send you a sample of mine, and the manner of preparing it, reduced to avoirdupoise pounds.

Mercury, one lb. of 16 oz. } dissolve in glass.
Nitric Acid, one im. pint. }

Cocoa-nut oil, four pounds of 16 oz. } melt.
Olive-oil, six wine pints, 16 oz. }

Pour the melted oils into a stone pot, the shallower the better; add the acid and mercury, and stir them often with a wooden spatula. In twenty-four hours it will acquire a proper consistence.

It makes an ointment of a beautiful gold color, and seldom gets harder than lard, at least with me. If less cocoa-nut oil is used, it makes an ointment of the consistence of cream. I use one-eleventh part of nitric acid less than is ordered by the Pharmacopœia. If you think this worthy a place in your small, but valuable publication, it is at your service. I am, Gentlemen, your obedient servant,

John Harvey.

P.S. The quickest method of killing the quicksilver in the preparation of Ung. Hyd. Fort. is to take two ounces of Ung. Hyd. Fort. that has been made some time (say a month), and add the quicksilver by degrees, say, half an ounce at a time; one pound of it is, by this means, killed in ten minutes, and the ointment speedily completed; the stiffer the old ointment the better. I make large quantities of both ointments, and have tried all methods, but never found any to succeed better than the formulæ I have sent.

J. Harvey.

[The sample of ointment with which our correspondent has favored us, certainly is of very superior quality.]

ON THE EXTERNAL USE OF THE OLEUM JECORIS OSELLI (COD-LIVER-OIL.)

BY DR. BRACH.

For external use, Dr. Brach makes a liniment with liquor ammoniæ, in the proportion of two parts of the former to one of the latter; and finds this compound to be rubbed on the skin with more facility than the plain oil, and to possess the additional advantages of freedom from the unpleasant odor of the latter, and a greater facility of being removed from the linen that may be stained with it. He has used this mixture often, and with good effects in chronic rheumatism and arthritic complaints, the pains of which it sometimes very speedily relieves. In scrofulous enlargements of the glands, in scrofulous diseases of the skin, and in chilblains.—Allgemeine's Repertorium, October, 1840.

POISONING BY FLOUR CONTAINING LEAD.

BY DR. SCHILBACH.

Six members of a family were suddenly seized with obstinate constipation, uneasiness, vomiting, and colic; to these symptoms succeeded spasms and severe pains, principally of the hands and feet, remarkable emaciation, paleness and anxiety. The eldest son, who suffered most, presented dilatation of the pupils, paralytic rigidity of the limbs, retraction of the abdomen, a livid complexion, and excessive emaciation. It was supposed that these symptoms arose from poisoning with lead, but without the least trace of the poison, until at last it was found out that the cupboard where the family kept their flour, there was a box full of small shot (oxidised cendric). As this box was cracked, it was supposed that a certain quantity had fallen into the flour, and accordingly an analysis of a small portion of the flour that still remained showed traces of this metal.

The patients gradually recovered after treatment with calomel and opium, and other medicines. The author cites as illustrative of this interesting case, one of severe lead colic, brought on by drinking wine from a bottle which contained some grains of lead.

EXPERIMENTS MADE ON THE ORGANS OF A DOG POISONED BY MIXTURE OF ARSENIOUS ACID AND OPIUM, WITH THE VIEW OF DETERMINING WHETHER THE ABSORPTION OF THESE TWO SUBSTANCES COULD BE SIMULTANEOUSLY CARRIED ON, AND IN THE PROPORTION IN WHICH THEY WERE ABSORBED.*

BY M. J. L. LAISSAIGNE.

Most of the experiments concerning the absorption of poisons which at different times have been tried, have in general been made on one toxical substance at a time, and in most cases with simple or compound minerals, whose presence in the blood and secreted fluids may easily be detected by chemical tests.

Experiments undertaken at different times to detect in the blood and organs of animals killed by the action of *organic poisons*, traces of those principles, have always given negative results; thus it is that the first experiments which we made in 1823 on the blood and urine of animals poisoned by the salts of morphia did not enable us to detect in those fluids the presence of that alkaloid. The same conclusions were drawn in 1826 by MM. Barruel, Sen., and Dublune, Jun., from their investigations concerning the blood and urine of a person who died from swallowing a large dose of Sydenham's laudanum.†

The new facts observed by M. Orfila, concerning the presence of mineral poisons in the organs and in the fluids secreted after poisoning, have naturally led toxicologists to try fresh experiments with the view of detecting organic poisons when absorbed.

It is with this object that we have undertaken this double experiment, which forms the subject of our present communication.

On the 12th of January last, we injected into the stomach of an old hound, in good health, a decilitre of water containing in solution 0·5 grammes of arsenious acid, and also the soluble parts of 12 grammes of crude opium. The injection was made by means of an incision in the œsophagus, and immediately below this aperture a ligature was made, as well as at the extremity of the penis to prevent the passage of the urine, which might be secreted while the animal was under the influence of the poisonous matter.

A few minutes after the injection, the animal experienced nausea, and foamed at the mouth; it was agitated, and became restless: a quarter of an hour after these effects, it became calm, and was under the influence of the narcotic: this state lasted for three hours, when it died.

The post mortem examination was very carefully made: we extracted the liver and heart, and collected all the blood contained in the cavity, and the urine, which was about three-quarters of a decilitre in quantity.

Each of these parts was first examined by the process for detecting arsenic, which we had every reason to suppose existed in them, from previous experiments on the same organs, taken from a dog poisoned by the same quantity of arsenious acid, but administered alone. The results which we obtained did not permit us to conclude the existence of arsenic, at least the traces that we found were not sufficiently distinct to establish our conviction.

Our attention, therefore, was attracted to the detection of the principles of opium, which, in this case, were, without doubt, opposed to the absorption of the arsenious acid, ordinarily so rapid. To attain this

* *Journal de Chimie Medicale*, April, 1841.

† *Journal de Chimie Medicale*, 1826, first series.

object, we acted successively on other portions of the liver, blood, and urine of the same animal.

A portion of urine evaporated under the receiver of the pneumatic machine, yielded a residue of a light yellow color, in which neither the salts of peroxide of iron, nor concentrated nitric acid manifested the reactions of either meconic acid or morphia. This residue re-dissolved in a small quantity of water was boiled with a little calcined magnesia which was afterwards collected on a small filter. This magnesian precipitate, washed and treated by boiling alcohol, did not give a trace of morphine.

The remainder of the blood was diluted in water acidulated with sulphuric acid, and the liquid was boiled for ten or twelve minutes. The resulting liquid, separated by filtration, was evaporated by heat, in a porcelain capsule. The residue of this evaporation was treated by cold alcohol, to re-dissolve among other principles, the sulphate of morphine, if present. The alcoholic solution yielded a residue in which it was impossible to detect the presence of morphine by means of reagents employed for that purpose.

The remaining portion of the liver, cut in small pieces, was treated, with the aid of heat, by three or four times its weight of water acidulated with sulphuric acid: the acid decoction, subjected to the same operations as the blood, gave the same results, proving the non-existence of the principles of opium in that organ.

Unless the experiment which we have detailed is incorrect, it tends to show:

1st. That opium mixed with arsenious acid, by a special action on the stomach, opposed the too rapid absorption of that acid:

2nd. That although the animal, without doubt, died from the combined effects of these two poisons, traces of their presence in the blood, urine and liver, have not been chemically discovered.

MEANS OF DISGUISING THE TASTE OF CERTAIN SUBSTANCES.*

BY M. DESCHAMPS.

The modifications to which I have subjected the process which I proposed in 1838, for disguising the taste of pills, being so important as to make this process a new one, I have the honour of submitting it, if you think fit, to the Société de Chimie Medicale:—

℞: Solid honey . . 60.00gr.
Water . . . . 6·00

Heat it in the sand-bath, and let it cool.

Put the pills and the honey in the hand, roll them and mould them together, and let them fall on powdered gum tragacanth, and shake them up. It is necessary thus to give them, at as short intervals as possible, two or three layers, and to let these two or three layers dry for one or two hours, or one or two days, according to the time that can be spared.

Weigh in a wide-mouthed flask:—

Grénétine . . . . . 50.00gr.
Alcohol at 32C. . . . . 25·00
Water 125.02

Heat in the sand-bath. When the solution is finished, place in the hand some pills prepared with gum and some gelatinous liquid; operate as above, and put them in iron moulds slightly greased.

This gelatinous solution may be employed for covering pills, as a substitute for silver.

* *Journal de Chimie Medicale*, April, 1841.

MEANS OF PRESERVING THE ERGOT OF RYE.†

BY M. MARTIN.

Many means have been employed for preserving the ergot of rye; I think that the one which I point out is the best, as I have preserved it for more than two years by it, and it is perfectly intact.

The following is the method that I adopt:—

Ergot in good condition and very dry is steeped in a concentrated solution of gum arabic, and dried on a sheet of white iron. When it is dry, the operation is repeated: two or three immersions are sufficient. When the last layer of gum is perfectly dry, the ergot is kept in a very dry and well corked flask.

I think that gum arabic cannot be prejudicial to the effect of ergot of rye.

ON GILDING AND SILVERING PILLS.

To the Editors of the Chemist.

Gentlemen:—On reading the last number of your Journal, I find the question:—How to silver and to gild pills, and with pleasure I answer that question.

† *Journal de Chimie Medicale*, April, 1841.

The remark of B. B., is but too correct in saying, — "That the present mode adopted, is very inferior and attended with great waste." The way I have exercised for a number of years, and in which I find less waste than in any other I am acquainted with, enables to gild or silver with one leaf, about two dozen or more pills.

It is particularly necessary to see that no powder of any description is on the pills or the machine employed, and that the consistence is quite perfect; if too moist, it would, as a matter of course, consume a larger portion of silver, and if too hard, they must be moistened with a little mucilage and rubbed dry again; then use a turned wooden box, quite round inside, and introduce first about half the portion of silver into the box; put the pills upon the silver and shake it well, it will easily be seen how much more is required. A little silver, which adheres to the sides of the box, may be removed and used for other purposes. If the mass is good, the pill will only cover itself well, and will leave the superfluous silver in lammellæ in the box. It is necessary to employ an extra box for scented pills.

I think it will not be intruding, should I say a few words respecting the binding of oils with water through the medium of gum arabic, which generally takes a long time, and by which they are often spoiled or sent out imperfect. By the method which I adopt, any one will be able to bind with one drachm of gum, an ounce of almond or any other sort of oil, which is, I think, of importance, as many medical men find the great quantity of gum, used for binding the oil an obstacle, as it frequently counteracts the effects of the same.

Take one drachm of gum arabic and two of oil, mix well together, and add at once two drachms of water, or a few drops more, but never less, and rub them together; it makes in a few moments a perfect emulsion. The remainder of the oil may be gradually added, and if it should become too stiff, put a little more water to it. The more gum there is taken, the longer the emulsion will keep; but I have always found that the smallest quantity used kept twenty-four hours.

It will afford me much pleasure to spend some of my leisure hours in writing a few remarks on several pharmaceutical preparations, which I will send to you, and if you, Gentlemen, should approve of the same, you may insert them in your journal, with whose rapid advances, I am much pleased.

Yours obliged,
S.

[The above renders it unnecessary to insert the communications of W.W. and J.M.]

BOOKS RECEIVED.

Homœopathy Explained, and Objections Answered. London: T. Hurst, 5, St. Paul's Churchyard.

Annals of The London Homœopathic Dispensary, 31, Ely Place, Holborn. Physician, Dr. Curie. Nos. I. to XI. London: T. Hurst.

Edinburgh Monthly Journal of Medical Science. No. V., May, 1841.

[We regret being unable to give a review of these works in our present number: we will do so in our next.]

TO CORRESPONDENTS.

G. T.—It is an amalgam, we believe, of one part of mercury, and three parts of silver.

We consider Dr. Turner's work well adapted for a beginner. Brande's Manual is also a most excellent work.

A Dispensing Chemist.—Turner's or Brande's Chemistry; Burnett's Botany; Pereira's Materia Medica, and Brande's Pharmacy.

Communications Received from—"An Amateur Sculptor;" Mr. Haviland; Mr. Lucas; J. G.; J. S. S.; J. J. M.; A Druggist; A. B. C.; A Subscriber (Newcastle); A Reader; A Chemical Student (two letters); An Assistant. Answers in our next.

Nota Bene.—*All Communications and Books for Review must be addressed, "To the Editors of The Chemist, care of Mr. Hastings, Publisher, 13, Carey-street, Lincoln's Inn Fields, London." Communications must be pre-paid, and sent before the 15th of each month; Books for Review, before the 10th.*

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THE CHEMIST.

I. CHEMISTRY.

NEW INVESTIGATIONS CONCERNING GALLIC ACID.

BY M. ANTOINE LAROCQUE.

Gallic acid was discovered by Scheele in 1780, by allowing nut-galls to rot. He admitted the pre-existence of the acid in that substance, and this erroneous opinion was long held by chemists. It was only lately that M. Pelouze, in an excellent memoir on gallic acid, showed that it did not exist in nut-galls, and that the latter contained, on the contrary, nearly half their weight of tannic acid, which, according to M. P., under the influence of oxygen, gives rise to gallic acid, with a disengagement of carbonic acid. M. Robiquet differed in opinion from M. Pelouze, as to the causes of the formation of gallic acid; he thought it was under the influence of fermentation that the change is effected. However, as M. R. had not made any direct experiment in order to verify this view, I thought it very desirable to ascertain under what influence this change is brought about.

This, indeed, I had long intended to attempt, but I was timid of undertaking a subject so successfully treated by M. Pelouze. I doubted my power, but, encouraged by those to whom I had confided my ideas, I set to work. I had in my favor, the opinion of my illustrious and excellent master, M. Robiquet, and as I wished to examine nut-galls in another point of view, I determined on making investigations, resolving not to publish them unless they were interesting.

The following is the course which I pursued. I divided this memoir into three parts: in the first, I treat of the action of certain chemical bodies on macerated nut-galls; in the second, I investigate under what influence tannin is converted into gallic acid; finally, in the third part, I study the action of nut-galls on a solution of sugar, and the action of certain ferments on a solution of tannin.

I may add that I used sulphate of quinine to precipitate the tannin from my liquors: sulphate of quinine also accurately precipitates tannic acid from a solution; at least, gelatine causes no further precipitate in a liquid treated by it. The filters which I used were washed in hydrochloric acid. I always operated on 5 gram. of liquid diluted with 10 gram. of water, from which I precipitated the tannin by an excess of sulphate of quinine. I always left the precipitates until next day to form. I collected them on filters, washed them with distilled water, then dried them, and it was only after having ascertained that they lost nothing more by heat, that I weighed them.

FIRST PART.

EXAMINATION OF THE INFLUENCE OF CERTAIN CHEMICAL AGENTS ON GALLIC FERMENTATION; ITS RESEMBLANCE TO ALCOHOLIC AND PUTRID FERMENTATION.

Do not certain bodies prevent or hinder gallic fermentation, or the conversion of tannin into gallic acid? It was very curious to ascertain whether the bodies which prevent or hinder, for some time, the alcoholic or putrid fermentation, had any action on the transformation of tannin into gallic acid.

I ascertained by many experiments which I am about to detail, that oxide of mercury, alcohol, nitric, hydro-chloric and sulphuric acids, bromine, essence of turpentine, creosote, oxalic, acetic and prussic acids, had the most powerful action on it. Among those which have a less energetic action, may be ranked arseniate of soda and corrosive sublimate; camphor, citric acid and red oxide of mercury, are without action on it; tartaric acid, on the contrary, appeared to favor this fermentation.

The following is the manner in which I operated: the experiments were commenced on the 25th of September.

I put 20 gram. of powdered nut-galls into 110 gram. of water, and placed the vessel in a room where the temperature varied from 10° to 15° C. I prepared four similar liquids, and on the 2nd of November, I precipitated 5 gr. from each of them by the salt of quinine. I obtained the following results:—0·03 centigram. of tannate of quinine in two liquors, and in the other two, 0·033 and 0·031 milligrammes of tannate of quinine. These precipitates were obtained in a type liquor, and served me for comparison with those of other liquors.

ALCOHOL AND WATER.

Alcohol ..... 50 gram.
Water ..... 60 „
Nut-galls .... 20 „

I prepared four similar liquors, and obtained the following weights:—

0·45 centigr.
0·47 „
0·46 „
0·46 „
} Tannate of quinine.

WATER AND OXIDE OF MERCURY.

Water ..... 110 gram.
Powdered nut-galls.. 20 „
Oxide of mercury .. 1 „

I prepared four similar liquors, on which I may make the following remarks:—

The oxide of mercury, a few days after its contact with the liquor, became brown; it appeared to be reduced to the state of black oxide; I examined it with a lens, but could not find any metallic globules. By means of a thread, I suspended a piece of oxide of mercury weighing several grammes, in nut-galls in a state of maceration: after eight days it acquired a chocolate brown color, which increased by longer contact; the interior of this oxide was of a reddish brown color. Was a deoxidizing gas disengaged from the nut-galls? Was this gas carburetted hydrogen or pure hydrogen? This I was unable to ascertain. It is known, indeed, that nascent hydrogen reduces certain metallic oxides; that of iron, for instance, is very rapidly deoxidized: at the *Hôpital de la Charité*, I suggested this as a means of removing iron-mould from linen.

It may be said that this reduction is owing to tannin; but to ascertain this, I put some oxide of mercury into a solution of tannin, and left it there for more than six weeks, and after that time, the oxide of mercury retained its red colour: it is not owing to the contact of that oxide with nut-galls, since that which was suspended in the liquor became brown. The following are the weights of the precipitate obtained in these liquors:—

0·64 cent.
0·65 „
0·65 „
0·63 „
} Tannate of quinine.

ARSENIATE OF SODA AND WATER.

In 110 grammes of water, I dissolved 1 gram. of crystallized arseniate of soda, and I added to the solution 20 gram. of powdered nut-galls, I prepared four similar liquids, and obtained the following results, always operating on 5 gram. of

0·25 cent.
0·23 „
0·27 „
0·24 „
} Tannate of quinine.

BICHLORIDE OF MERCURY.

In 110 gram. of water, I dissolved 5 decigr. of corrosive sublimate; I added a few drops of alcohol to facilitate the solution, and I mixed with the liquid 20 gram. of powdered nutgalls. Four liquids prepared in this manner gave, on the 6th of November, the following results:—

0·17 cent.
0·17 „
0·17 „
0·16 „
} Tannate of quinine.

On the 16th of December I made some new experiments to ascertain the action of certain other agents on gallic fermentation; for these new experiments, I likewise took 110 gram. of water, and 20 gram. of powdered nut-galls; I always operated on 5 gram. of liquor. In these experiments, I took the same precautions as in the preceding. Into 110 gram. of water, I put 20 gram. of powdered nut-galls; three days after, I precipitated the tannin from 5 gram. of the liquor by the salt of quinine; I obtained 60 cent. of the tannate; thence I ascertained to what point the bodies which I put in contact would form an obstacle to the progress of the phenomenon. After 28 days' contact, I again precipitated the tannin from 5 gram. of liquor, and I obtained only 20 cent. of tannate of quinine; the conversion of tannin into gallic acid was therefore about ⅔. Let us see if we shall obtain similar results in the following liquors, but containing chemical agents. In the liquor into which I had put 6 drops of creosote, I obtained, after twenty-eight days' contact, 0·35 of tannate; in the liquor containing 30 drops of essential oil of turpentine, 0·43 cent. of tannate; in that to which I had added 12 drops of castor oil, 0·22 cent., the liquor containing 6 decig. of citric acid, 0·20 cent.; and the liquor containing 6 decig. of tartaric acid, and 0·15 cent. of tannate.

With the following liquids prepared in the same proportions (110 gram. of water and 20 gram. of nut-galls), and to which I

had added—to the first, 20 drops of pyroligneous acid, to the second 12 drops of sulphuric acid, to the third 12 drops of nitric acid, to the fourth 12 drops of hydrochloric acid, to the fifth 12 drops of bromine, and to the sixth, 12 drops of prussic acid—I obtained the following results :—

The acetic liquor gave	0·35 cent.	Tannate of quinine.
The sulphuric	,, 0·59 cent.	
The nitric	,, 0·55 cent.	
The hydrochloric	,, 0·50 cent.	
The bromic	,, 0·45 cent.	
The prussic	,, 0·35 cent.	

These results appeared to me to be very curious. Indeed, in the liquors where no agent could modify the progress of the phenomenon, the tannin was almost entirely converted into gallic acid, whilst in the liquors containing the above-mentioned bodies the progress of the fermentation is arrested, and very little gallic acid is formed. If among these bodies there be some which do not act with so much energy as in the alcoholic fermentation, it must be attributed to their having been used in too small quantities, or perhaps to a double decomposition, as is the case with the bichloride of mercury. With regard to the arseniate of soda, it is known, from M. Quevenne's experiments, that arsenious acid does not stop the fermentation of sugar; the same also, from the action exerted by that salt on the fermentation of galls, it may be concluded that it has only a very feeble action on the progress of the phenomenon. I will not call to mind the action of acids, nor that of alcohol: these bodies are frequently employed to stop putrid or alcoholic fermentation. The action of oxide of mercury on alcoholic fermentation is well known; indeed, this oxide has long been used by the Burgundians for preventing vinous fermentation in the barrels; it also seems to possess the greatest power of stopping the fermentation of galls.

Now, what are the points of resemblance between these three kinds of fermentation? They have the same action with the same substances; I think also that it is impossible to separate them, for in all there is a disengagement of gas and of heat, a developement of ferment, and the conversion of one body into another.

I say that there is a deposit of ferment; indeed, if we examine with the microscope the yellowish-white or greyish-white powder which is deposited in macerated nut-galls, or in a filtered infusion of the same, we find in that deposit all the properties of beer yeast; however that of nut-galls is less in quantity; the globules are paler, and under the form of links. These are from $\frac{1}{100}$ to $\frac{1}{200}$ of a millimetre. There are also deposited in these liquors, flocks of an albuminous appearance, which, examined with the microscope, are presented under an arborescent form, with spreading branches. They are bifurcated and sprinkled with black spots.

Liebig is of opinion that the conversion of tannin into gallic acid, when nut-galls are allowed to ferment, is a phenomenon of *érémacausie*. I will quote *verbatim* the paragraph 3 of the *Revue Scientifique* for June, page 393, and paragraph 11, page 403, of the same work.

In paragraph 3 that chemist says, "*Érémacausie* (vulgarly called rotting) differs from fermentation and putrifaction in its not taking place without contact with the air, which acts by means of its oxygen; it is a kind of slow combustion which, under all circumstances, disengages heat and sometimes light." In paragraph 11, he adds :—"Most organic substances, put in contact with matters in a state of *érémacausie*, themselves undergo that alteration; it may almost be said that it is propagated by a kind of contagion. Wood, when rotting, brings fresh wood to the same condition; and it is the finely divided rotting woody matter that so rapidly converts the tannic acid of nut-galls into gallic acid."

Then, to sum up Liebig's idea, the presence of oxygen and woody matter is indispensable for effecting the transformation of tannin into gallic acid; I will mention facts which will prove that the contrary is the case.

In the first place, I assert that in this transformation rotting does not always take place; moreover, the presence of oxygen is not indispensable for effecting the conversion of tannin into gallic acid; it is a fact acquired to science, and the discovery of which is due to M. Robiquet. I will also mention an experiment which I made, in which there were only a few bubbles of air that I could not get rid of, and in which I effected the conversion of tannin into gallic acid. Indeed, by admitting the phenomenon of *érémacausie*, how is the conversion of tannin into gallic acid, when an infusion of nut-galls freed from all woody matter by filtration is exposed to the air, to be explained? All these facts are inexplicable according to the phenomenon of *érémacausie*, and are naturally explained when fermentation is admitted.

I have said that rotting does not always occur; I have also said that in the presence of a scarcely perceptible quantity of air, I obtained the conversion of tannin into gallic acid; the following experiment, which I have thrice repeated, proves what I have just advanced :—

I put into a flask stopped with emery 10 gr. of nut-galls which had been acted on by ether, 5 gr. of tannin, and 123 gr. of water. The flask was exactly filled, with the exception of a bubble or two of air which remained in it. I luted the flask to prevent

the air from penetrating into it, and I thus exposed it for a month to a temperature varying from 6° to 10°; during that time it showed no trace of mouldiness, which destroyed the idea of its rotting; moreover, all the tannin was converted into gallic acid; it is necessary also to remark that there was no perceptible disengagement of gas.

It is very evident that the conversion of tannin into gallic acid cannot be owing to *érémacausie*, for in paragraph 3 above quoted, M. Liebig sets forth that *érémacausie* differs from fermentation, in not being effected without the contact of the air, which acts by means of its oxygen; however, since under a small quantity of air, tannin has been converted into gallic acid, it is evident that there is some other agent than oxygen, under the influence of which this transformation is effected; for I repeat, it is only in contact with a great quantity of air that *érémacausie* can be developed, and not in a vessel where there is only an inappreciable quantity of oxygen gas.

Moreover, M. Robiquet, in a memoir printed in the *Annales de Chimie et de Physique*, Vol. lxiv., says that he obtained gallic acid from nut-galls without their rotting, and without contact with the air. Finally, I will mention another fact which appears to me conclusive against the phenomenon of *érémacausie* applied to the formation of gallic acid. When a filtered infusion of nut-galls is exposed to the air, after a certain time it allows a certain quantity of gallic acid to deposit. It is decidedly not the woody matter which acts in this case; it is the ferment which is deposited after some days of contact with the air, that effects this transformation.

SECOND PART.

CAN TANNIN BE CONVERTED INTO GALLIC ACID UNDER SEVERAL INFLUENCES?

Tannin may be converted into gallic acid under the influence of several bodies, for it results from M. Pelouze's experiments that a solution of tannin, under the influence of oxygen, is transformed into gallic acid, giving rise to a disengagement of carbonic acid. This change is not however effected in a very short space of time, for M. Robiquet proved that this change took place only after some months of contact, and also that nearly half of the tannin underwent this alteration. If it requires so long a time to effect this under the influence of oxygen, we shall find in nut-galls a body which will do it in a much shorter space of time. I will show also that a very small quantity of nut-galls is capable of converting a large quantity of tannin into gallic acid. The following are the experiments which I made to ascertain under what influence this change is operated. I used nut-galls exhausted by ether, as a ferment; I put it in contact with the solution of tannin; I made another solution of tannin which served as a type liquor, or liquor of comparison.

On the 27th of August, 1840, I took 10 gr. of nut-galls exhausted by ether, 5 gr. of tannic acid, and 110 gr. of water; the type liquor consisted of 110 gr. of water and 5 gr. of tannic acid. I kept these liquors in flasks covered with paper perforated with holes, until the 21st of September, and as I then wished to ascertain the state of the liquors, I took 1 gr. of each and added an excess of sulphate of quinine: I obtained no precipitate from that containing the nut-galls; the type liquor, on the contrary, gave an abundant precipitate. I did not expect so good a result: I multiplied my experiments, and the following corroborate the preceding. It will be seen that a small quantity of nut-galls is capable of converting 15 gr. of tannin into gallic acid.

On the 23d of September, I put into a wide-mouthed flask, of the capacity of 125 gr. 5 gr. of tannin, 5 gr. of nut-galls exhausted by ether, and 100 gr. of distilled water, and I exposed it to the air until the 7th of November. Into a second flask, to the same quantity of water and nut-galls, I added 8 gr. of tannic acid, and to a third, 15 gr. of tannic acid. On the 7th of November, I precipitated the tannin from 5 gr. of each of these liquors, and I obtained exactly the same weight of tannate of quinine from each—0·04 cent. These experiments appeared to me very curious, inasmuch as even 15 gr. of tannin under the influence of 5 gr. of nut-galls exhausted by ether, convert in a very short time as large a quantity of tannin. Finally, two other experiments made with 5 gr. of tannin, 128 gr. of water and 5 gr. of nut-galls exhausted by ether, gave me, after a contact of a month, 0·04 cent. of tannate of quinine, whilst two other liquors prepared with the same proportions of water and tannin, without any nut-galls, yielded 0·30 of that salt. These four liquors were prepared on the same day, and were exposed to the same influences.

If it had not been shown by M. Pelouze's experiments that gallic acid did not pre-exist in nut-galls, those which I have detailed would have more evidently demonstrated it.

THIRD PART.

DOES THERE EXIST IN NUT-GALLS A FERMENT CAPABLE OF CONVERTING SUGAR INTO ALCOHOL?

This property, which sugar possesses, of being converted into alcohol and carbonic acid under the influence of certain bodies is very remarkable: it has been called fer-

mentation. Many bodies possess this property in a greater or less degree. In the first rank must be placed beer yeast; it converts sugar into alcohol, in a very short time, when the temperature is suitably raised. Albumen, fibrine, caseous matter, muscular flesh, &c., possess this property in a minor degree. There is a substance which has not yet been noticed as a ferment, and which, notwithstanding, possesses that property in a high degree—I mean nut-galls. I mixed about 30 or 40 gr. of sugar, 300 gr. of water, and 20 or 25 gr. of nut-galls. I exposed the mixture to a temperature of 18 or 20° C.: some time after, the fermentation was perfectly set up; still the bubbles of gas which I passed into a vessel filled with water were not very numerous, for a day or two; but after that time, a disengagement of carbonic acid took place in a tumultuous manner; it lasted 12 or 15 days; I strained the liquor and distilled it; I extracted by the first distillation 125 gr. of liquor marking 12½°; a second distillation gave 30 gr. of alcohol marking 17°.

I made another experiment with nut-galls exhausted by ether, in nearly the same proportions as the preceding, and I remarked that it stopped for two days and commenced with fresh energy. One thing in particular appeared to me to be worth attention, and that is, the entirely different odour which these two liquors possessed: that which was fermented with nut-galls exhausted by ether, had an acetic odour, whilst the other, on the contrary, had the odour of fermenting matters, that of beer for example.

Towards the month of November, at a season when the temperature is unfavourable to the developement of fermentation, I made new experiments, in order to ascertain whether the variations of temperature influenced the progress of the phenomenon; I did not obtain a regular fermentation; I did not even effect the alcoholisation of the sugar, when I submitted the mixture alternately to a strong heat, and cold.

I have also ascertained that nut-galls moistened with water and exposed to a temperature of 8 or 10° below zero, for 24 hours, have not lost the property of fermenting sugar. Heat, on the contrary, destroys this property, at least for a certain time. I put into 300 gr. of water, 20 grammes of nut-galls and 30 gr. of sugar; I raised the temperature of the mixture to 40°, and let it cool, and so on, several times, and I obtained no fermentation. I plunged a liquor into water marking 60° C.; much carbonic acid gas was disengaged; I removed the flask from the warm water, and it showed but very uncertain signs of fermentation.

The temperature which appears best suited for fermentation is that of 18 to 20° C., and a mixture of 1 part of nut-galls, 4 of sugar, and 7 of water. However, fermentation commences at 10° C.; weak at first, it increases as the temperature approaches 18 or 20° C.

The property which the ferment of nut-galls possesses, of converting sugar into alcohol, being known to me, I wished to ascertain whether that of beer would change tannin into gallic acid; I put into a flask 5 gr. of tannin, 5 or 6 gr. of beer yeast, and 300 of water. I exposed the mixture to a variable temperature; twenty days after it slightly precipitated the solution of sulphate of quinine; I exposed the vessel to a temperature of more than 30° C., for 4 days, and after that time the liquor had no action on the solution of sulphate of quinine; I filtered it with a paper washed in hydrochloric acid, and I obtained a blackish residue of insupportable bitterness, with an acid reaction. I dissolved it with alcohol and animal charcoal, and allowed it to filter spontaneously. I procured a small quantity of gallic acid under the form of stellated needles.

In the month of December, I put fresh ferment in contact with tannin: on the 15th of January all the tannin was not converted into gallic acid. This difference of results was owing to my not having operated in the same manner as before.

If beer yeast does not convert tannin into gallic acid as rapidly as might be expected, it is not the same with muscular flesh, blood, &c. Indeed, I put into 180 gr. of water, 5 gr. of tannin, and nearly 60 gr. of muscular flesh; I exposed the whole to a temperature of 10 or 12° C., then I raised it to 15 or 18°. This liquor acquired a slight putrid odour, and a month afterwards it was without action on sulphate of quinine and the solution of gelatine; the filtered liquor, evaporated to dryness, and re-dissolved with alcohol and animal charcoal, was filtered and set to evaporate in the sand-bath to three-fourths; left to spontaneous evaporation, it gave crystals of gallic acid of a rather deep red-brown color. I made another experiment with putrified blood, and after twelve days' contact, the liquor did not precipitate the salt of quinine. I could not procure the gallic acid from this liquor, the flask having broken on the fire.

I made another experiment with meat in a state of putrefaction: I left it for one or two hours in contact, then I precipitated 5 gr. of the liquor, and obtained 0·35 of tannate; four days after, the same quantity of liquor gave me only 0·10 cent., and after 10 days, it scarcely precipitated the solution of sulphate of quinine at all. I filtered this liquor, evaporated it to dryness in a sand-bath, then I re-dissolved it in alcohol and animal charcoal, filtered it, and left it to spontaneous evaporation: there remained in

the capsule a small quantity of a reddish matter, which was submitted to the action of ether, which, spontaneously evaporated, left small quantities of gallic acid.

In this experiment, the tannin must be converted into other products, or form a combination with the meat, for I obtained only a very small quantity of gallic acid. However, I got sufficient to prove that it was not under the influence of oxygen that it was formed.

Caseous matter also possesses the property of converting tannin into gallic acid; however, it is only after a much longer contact than with meat.

SUMMARY OF THE PRINCIPAL FACTS.

1st, Tannin may be converted into gallic acid under several influences: first, as M. Pelouze observed, under that of oxygen, and under that of a ferment.

2d, Certain chemical bodies prevent, for a certain time, the conversion of tannin into gallic acid.

3d, It is not to the phenomenon of *érémacausie* that this conversion must be attributed.

4th, The ferment of nutgalls converts sugar into alcohol and carbonic acid, as does that of beer.

5th, Beer yeast, muscular flesh, and caseous matter change tannin into gallic acid.

6th, Finally, in the conversion of tannin into gallic acid, the quantity of gas disengaged is scarcely perceptible.

INVESTIGATIONS CONCERNING LACTIC FERMENTATION.*

BY MM. BOUTRON-CHARLARD AND E. FREMY.

We proposed to study the circumstances in which lactic acid is formed, and accurately to ascertain the nature of the agents which determine its formation. As the experiments that we are going to describe depend on a single force which is very analagous to that which gives rise to alcoholic fermentation, we have given it the name of *lactic fermentation*.

Our object was not only to find a means of producing at will a body which is as important in a theoretical point of view as in its medicinal applications, but especially to determine the mode of production of an organic acid which bears so striking an analogy to malic, citric, and tartaric acids, concerning the formation of which we have not, at present, any precise data.

We may recapitulate the works which we have found useful in our investigations: we may mention in the first place, those of M. Thenard, on the action of albumen on sugar; the experiments of M. Persoz, on diastasis; those of M. Dubrunfaut, on fermentation; and the observations which Liebig has lately published in his *Organic Chemistry*. Finally, we have connected our experiments with those made by one of us, M. Fremy, on pectine and pectic acid (See *The Chemist*, Vol. I, No. VIII, page 233), and with the investigations which we published at the same time as M. Bussy, on the production of volatile oil of mustard. (See *The Chemist*, Vol. I. No. III, pp. 77 and 78, and No. IV., pp. 106 and 108.)

It is known that lactic acid is one of the most important which organic chemistry presents, and that it is formed under many circumstances. It is met with in almost all the fluids of the animal economy, in the products of the fermentation of vegetable juices, in the waste water of the starchmaker, and in milk exposed for several days to the air. We therefore examined the mode of producing lactic acid in the cases we have mentioned, first investigating the nature of the matter converted into that acid, as well as the properties of the ferment effecting this conversion. We ascertained that under the influence of certain animal matters, many neutral substances may be converted into lactic acid, and this conversion is the more clear as these substances are less likely to give rise to alcoholic fermentation: we may mention more particularly dextrine and sugar of milk.

All organised matters of vegetable or animal origin are apt, when exposed to the air for some time, to convert neutral substances into lactic acid.

By carefully studying the action of various animal matters on neutral substances, we remarked that they might, by going through different degrees of deorganisation, become susceptible of undergoing alterations corresponding to these degrees of decomposition. The *modus operandi* of a ferment does not, therefore, depend only on its nature, but also on the decompositon which it undergoes. Thus it is, for example, that diastasis may at first convert starch into dextrine and sugar, and afterwards into lactic acid, and finally into alcohol and carbonic acid.

From these data we understand, that when we wish to study the action of an animal matter on a neutral body, the decomposition of the ferment must necessarily be stopped; for otherwise, instead of obtaining the result of the action of a single ferment, we should have the complicated products of a series of ferments, each having its special property. To give an example in support of our assertion, we may say, that a membrane is capable of transforming it, as every one knows,

* Read before the Academy of Sciences, Paris, April 26, 1841: *Comptes Rendus*, No. 17.

into lactic acid, mannite, viscous matter, alcohol, and carbonic acid; but if we can stop the modifications which the membrane undergoes, it would then be ascertained that the products which we have just mentioned are not formed at the same time, but that they are the result of a successive alteration in the animal matter.

Does not this phenomenon bear great analogy to the observations which M. Pélouze has lately made on the distillation of organic matters? It is known, indeed, that he ascertained that, in order to study the successive modifications which an organic matter undergoes by distillation, it is important to take account of the degree of heat to which it is submitted. We think, also, that in the study of lactic fermentation, account must be taken of the modifications which the ferment undergoes, in order not to fall into the very complicated reactions which the distillation of organic matters presented before M. Pelouze's investigations.

From the principles which we have just established, it results, therefore, that, to obtain a very clear lactic fermentation, a ferment which is not very alterable must be used.

In our Memoir we pointed out the characters of lactic fermentation, the real part acted by atmospheric air in this operation which causes the modifications of the ferment, and we come to the examination of the different products of lactic acid.

Thus, for example, to explain the presence of lactic acid in the liquids of the stomach, we submitted certain neutral bodies to the action of animal matters which are ordinarily in contact with them, and we ascertained that those which are easily altered give rise to a complex fermentation, whilst membranes which are less alterable are capable of converting neutral substances into pure lactic acid. We think that these facts, which may account for the presence of lactic acid in the animal economy, are worthy the attention of physiologists.

If we proceed thence to the examination of the formation of lactic acid in vegetables, we see that almost all matters of an albuminous nature are susceptible, when they have been modified by the contact of the air, of converting neutral substances into lactic acid. The most remarkable conversion of this kind is that which diastases causes in dextrine. Indeed, if cross-spired barley be exposed for two or three days to damp air, the diastasis which it contains is modified, and is then capable of converting dextrine into pure lactic acid. Does not this conversion to a certain extent explain the sudden appearance of acids in fruits, and does it not clear up some of the most obscure phenomena of vegetable physiology?

A high temperature may neutralize the actions of the animal matters which produce lactic fermentation, but it does not completely destroy it, for we have found that these matters may in many cases recover that property. This observation appears to us important in the consequences which it may have on the manufacture of sugar, for it has lately been proposed to dry the canes and the beet root, in order to be able to extract the sugar at a more favourable season. On examining dried canes and beet root, we found that they often contained a great quantity of lactic acid, which might, as every one is aware, occasion great losses in manufacture.

Finally, we proceed to the alteration which milk undergoes when exposed to the air, and showed that it is the caseum that converts the sugar of milk into lactic acid, that its action is stopped by the compound which it forms with the acid it produces, and that it may be rendered capable of again acting on sugar of milk, by saturating with bicarbonate of soda the lactic acid with which it is combined. We were thus enabled to convert not only all the sugar of milk into lactic acid, but also sugar of milk added. We think that this experiment accounts for one of the most important productions of lactic acid, and we are warranted in believing that caseum is the real ferment of sugar of milk, as beer yeast is to ordinary sugar. This trial has given us the means of preparing lactic acid at will, and we give, in our memoir, a detail of the process we followed.

We think then that the experiments of which we have now read an abstract, evidently show the influences under which lactic acid is formed, and that they prove that this acid is not one of the products of the complicated fermentation to which the name of viscous fermentation has been given, but that it is the product of a special fermentation to which we have given the name of lactic fermentation.

In a second memoir, we hope to prove that mannite is also the result of a peculiar fermentation.

ON THE DECOMPOSITIONS PRODUCED BY AFFINITY.*

BY REUBEN PHILLIPS.

The supposition that when two acids and a base are mixed in solution, the base is divided between them, is an opinion that has long been more or less prevalent in chemistry. The same view has been extended to the salts, and it has been supposed that when two soluble salts, such as the sulphate of potassa and nitrate of soda, are

* Communicated by the Author.

mixed together in solution, each acid appropriates to itself a portion of both bases, producing four salts. Turner has adopted these hypotheses in his *Elements of Chemistry*.

But if acids participate with each other in the possession of a base, why should not other substances do the same? Why should not iodine deprive chloride of potassium of part of its potassium? Why should not bromine, iodine and chlorine, share hydrogen between them? It may be said, that the affinities of these bodies are so different as to form exceptions to the rule. But is this division certainly known to take place in any case? In all cases, where, if it existed, evidence of it could be obtained, there, invariably, no such thing can be found. Can any one suppose, that a solution of hydrochloric acid, liberates hydriodic acid from a soluble iodide?

If any such participation does take place, then I can see no reason why hydrochloric acid should not displace some sulphuric acids from the sulphates; but I have experimentally ascertained such not to be the case.

I took three glasses, and placed in one, a portion of sulphate of soda, in another, some sulphate of magnesia, and in the third, alum: I then poured into each a quantity of hydrochloric acid; and a few minutes afterwards, added iodide of potassium and starch; but no iodide of starch was formed. Now, if free sulphuric acid existed in the solution, it would have decomposed the iodide of potassium, and the iodine must have united with the starch; but since no such effect was produced, I infer that the sulphuric acid was entirely confined to the bases.

With regard to this mutual participation when two salts are concerned, if it takes place in any case, I can assign no objection why chloride of sodium should not change the blue solution of sulphate of copper to a green, nor why, reciprocally, sulphate of soda should not change the green solution of chloride of copper to blue. I accordingly, took a concentrated solution of sulphate of copper, and added to it common salt, the colour instantly changed from blue to green; but by the intensity of the colour I was led to consider that the sulphate of copper had experienced entire decomposition, and I found upon adding sulphate of soda to the pure chloride of copper, the green tint not in the least impaired.

Since it cannot be proved that there is a participation of a base between two rival acids, and of an acid between two rival bases, and since it cannot be proved that the mingled solution of two salts present in equivalent proportions gives rise to four, and as much of an irreconcileable nature is known to the contrary, it appears to me that the doctrine should be entirely rejected, and that some theory, more consistent with facts, should be substituted in its room.

Now, it is well known that if two bodies are able to combine together, their mutual affinity is increased by the presence of a third substance capable of uniting with the compound which they produce. In cases of decomposition, where the whole or part of the resulting product is insoluble, I think there can be but little or no attraction exercised between the insoluble compound and the menstruum, so that cohesion, or the attraction of homogeneous particles, prevails; the explanation of this species of decomposition is now obvious: the affinity is governed, not by the influence of a third substance, but by the attraction of the particles of the insoluble substances for each other. If, for instance, the solutions of nitrate of baryta and sulphate of soda be mixed, the affinity of the sulphuric acid for baryta will be increased by the water having but a feeble attraction for the sulphate of baryta, whereby the atoms of that salt are enabled to combine together without much opposition.

It may certainly be asked, how the sulphate of baryta can act before it has any existence; but I apprehend that any explanation, suited to what was once called disposing affinity, equally applies to this.

ON THE DECOMPOSITION OF AMMONIA BY THE OXYGENOUS COMPOUNDS OF NITROGEN.*

BY M. J. PELOUZE.

When sulphuric acid is put in contact with nitrate of ammonia, at the ordinary temperature, this salt is gradually dissolved, and the liquor does not present any unexpected phenomenon, whatever may be the proportions or state of concentration of the bodies which compose it, that is to say, re-agents indicate in it ammonia, and sulphuric and nitric acids.

If the mixture contains water, and if it be submitted to distillation, nitric acid is procured, and also sulphate of ammonia, as theory indicates.

When, on the contrary, nitrate of ammonia has been deprived by heat of all the water which it can lose without being destroyed, and when heated in a very great excess of concentrated sulphuric acid, in fifty times its weight, for example, the contrary is the case. At 150° C., the mixture disengages a great quantity of protoxide of nitrogen, water is formed and combines with the sulphuric acid, and neither nitric acid nor ammonia are found in the products of

* *Journal de Pharmacie*, May, 1841.

this remarkable re-action. The nitrate of ammonia acts under these circumstances as it does, in a no less curious manner, under the sole influence of heat, and it is the only nitrate that does not disengage nitric acid on the addition of sulphuric acid, at the same time that it does not give up its base to that more energetic acid.

When the proportion of concentrated sulphuric acid is much diminished — when, for example, we operate with 10 parts of that acid and 1 part of nitrate of ammonia,—75 per cent. of this salt are decomposed into nitric acid and ammonia, and the remaining 25 into protoxide of nitrogen and water. By gradually diminishing the proportion of sulphuric acid, no protoxide of nitrogen is obtained, so that with one equivalent of nitrate of ammonia and two equivalents of sulphuric acid, the phenomena do not deviate from the ordinary rules of the decomposition of a salt by a more fixed acid.

These rules are also observed when, instead of carrying a mixture of nitrate of ammonia and a great excess of very concentrated sulphuric acid to 160° C., it is kept between 90° and 120° C. This temperature, though insufficient for the conversion of nitrate of ammonia into water and protoxide of nitrogen, is, however, high enough to distil the nitric acid eliminated by the sulphuric acid, and it passes into the receivers, without being accompanied by protoxide of nitrogen.

From the preceding facts it results that, according to the respective proportions of nitrate of ammonia and sulphuric acid, the temperature of the mixture and the quantity of water contained in it, the products of the decomposition are very different.

Analogy indicated that the nitrate of ammonia ought to act in a similar manner. Experiment confirmed this idea. This salt, decomposed by a great quantity of concentrated sulphuric acid, under the influence of heat, was converted into water and nitrogen.

The deutoxide of nitrogen seems less to give way to these re-actions: nevertheless, I easily decomposed it by means of ammonia, with the assistance of concentrated sulphuric acid. Profiting by the observation lately made by A. Rose (See *The Chemist*, No. XVIII., page 161), that monohydrated sulphuric acid directly combines with deutoxide of nitrogen, and absorbs very considerable quantities of that gas, I prepared this compound, dissolved sulphate of ammonia in it, and submitted it to a temperature of about 160° C. Perfectly pure nitrogen was disengaged, without any mixture of protoxide or deutoxide of nitrogen.

I varied this experiment by passing deutoxide of nitrogen into concentrated sulphuric acid mixed with sulphate of ammonia, and raised it to a temperature of from 150° to 200° C. The deutoxide of nitrogen was decomposed as in the preceding case, and pure nitrogen was disengaged. This gas was mixed with deutoxide only when the disengagement of the latter was too rapid.

The decomposition of ammonia by the deutoxide of nitrogen, in presence of concentrated sulphuric acid, is so easy, the nitrogen produced is so pure, and it is so regularly disengaged from the mixture, that I do not doubt but this re-action may be turned to account by chemists, for the preparation of this gas. Besides, this new process is very simple, for it is sufficient to make the sulphuric acid of commerce absorb deutoxide of nitrogen, and when it is wished to prepare nitrogen, to take this compound, and add to it sulphate of ammonia, and to gently heat the mixture.

This action is perfectly clear, and as a means of preparing nitrogen, leaves nothing to be desired.

As to the protoxide which is formed when an excess of concentrated sulphuric acid is heated with nitrate of ammonia, it is not pure; it always contains nitrogen, and it is sometimes mixed with traces of red vapors. It also sometimes happens that a very small quantity of nitric acid escapes from the mixture, and thus is freed by its volatility, from the ulterior action of the ammonia. However, the principal re-action, that which evidently regulates all the others, is the conversion of nitrate of ammonia into protoxide of nitrogen and water.

I have said above, that nitrate of ammonia, heated with ten times its weight of concentrated sulphuric acid, gave me nitric acid in such quantity, that only the fourth of that acid had been destroyed. As I had remarked in this re-action much protoxide of nitrogen, and but a small quantity of red vapors, I was led to doubt the complete accuracy of a fact which is mentioned in all chemical works; namely, that concentrated sulphuric acid decomposes nitric acid into water, with which it combines, into oxygen and into hyponitric acid. This doubt became certainty on seeing nitric acid disengaged at 100° C., from a mixture formed of nitrate of ammonia and an enormous excess of concentrated sulphuric acid. I mixed with 500 grammes of very concentrated sulphuric acid, 100 grammes of nitric acid of the density of 1·448. I slowly distilled this mixture, and I procured from it 88 grammes of nitric acid of the density of 1·520. This acid, freed by a gentle heat from the greater part of the red vapors which give it a yellow colour, was mixed with six and a half times its weight of very concentrated sulphuric acid, without any perceptible elevation of temperature. This mixture was colourless, and gave out extremely thick white fumes of nitric acid. Raised to a temperature not

exceeding 150° C., and for a long time kept as near as possible to 100° C., 82 grammes of nitric acid, the density of which was 1·520, and the boiling point of which was from 86° to 88° C., were distilled over.

A third rectification with sulphuric acid made no alteration in either the properties, density, or color of the nitric acid.

I am inclined to think that the small loss observed in the repeated distillations of nitric acid with sulphuric, must be attributed less to the action of the sulphuric acid than to the action of light, and especially to that of heat. This is certain, that the same loss is sensibly experienced in the distillation of monohydrated nitric acid, whether it be distilled alone, or with sulphuric *acid*, and that in both cases the proportion of red vapors is the same: the first hydrates of sulphuric and nitric acids appear to me to be without action on one another; there is no elevation of temperature when they are mixed. Nothing proves that one of these hydrates has more affinity than the other for the water which the latter contains above one equivalent; in its turn concentrated nitric acid can remove water from aqueous sulphuric acid.

The preceding observations have led me to employ with advantage concentrated sulphuric acid for concentrating nitric acid. To obtain this acid perfectly pure, it is sufficient to rectify, two or three times, the acid of commerce with sulphuric acid of ordinary quality, with the single precaution of not raising the temperature beyond 140° or 150° C. A gentle boiling, and a small quantity of puce oxide of lead added to the distilled acid, are sufficient for removing any hydro-chloric acid that it may retain. There does not remain in acid thus treated the smallest quantity of lead.

The property which ammonia possesses of decomposing, by its hydrogen, the various oxygenous compounds of nitrogen which are dissolved in sulphuric acid, is susceptible of a very important application — the purification of the sulphuric acid of commerce. This acid is frequently deteriorated by deutoxide of nitrogen and nitric acid, the presence of which is prejudicial under many circumstances. No rapid and economical process for freeing sulphuric acid from these nitrous compounds is yet known. Powdered sulphur, and lamp-black destroy them, it is true, but their employment is subject to many inconveniences which cause it to be abandoned. Sulphate of protoxide of iron answers this purpose very well; but the acid must be distilled, or a very considerable quantity of that salt would be left in it. Ammonia, or rather sulphate of ammonia, is the best agent that can be used for this purpose. The acids containing most of the nitrous compounds are completely freed from them by $\frac{1}{200}$ of their weight of sulphate of ammonia, and, in most cases, one or two thousandths are sufficient. A rapid and easy trial leaves not the slightest trace of ammonia in the purified acid, and shows exactly how much sulphate of ammonia must be added to the impure acid. Besides, even if a trace of ammonia did remain in the acid, it would be of no importance. At the present price of sulphate of ammonia, the purification of 100 kilogrammes of the sulphuric acid of commerce would not cost more than a penny or five farthings. Moreover, nothing need be changed in the present manufacture of this acid. All that is required is to add, when the acid is being concentrated, $\frac{1}{1000}$ or $\frac{2}{1000}$ of its weight of sulphate of ammonia. This salt is dissolved, and the operation is continued in the usual way.

The nitrous compounds with which the sulphuric acid of commerce is impregnated are the cause of the destruction of the platinum concentrating vessels; to their presence also must be attributed the alteration which indigo undergoes, the sulphuric solution of which is mixed with yellow matters, which are not formed when a purified acid is used. It is said, also, that the purification of oils does not succeed so well when an acid containing nitrous compounds is used.

Hydrochloric acid, prepared by decomposing sea salt with sulphuric acid, necessarily contains chlorine or nitro-hydrochloric acid, which is a very great defect. These inconveniences, and many others which I pass by in silence, do not exist when the mode of purification which I propose is used.

THE MIASMA OF AFRICA.—NIGER EXPEDITION.*

BY PROFESSOR DANIELL.

At the Royal Institution, Mr. J. F. Daniell read a paper "on the spontaneous evolution of sulphuretted hydrogen in the waters on the western coast of Africa and elsewhere."

He commenced by observing, that this subject was now interesting on two accounts — first, because it would recall to the members of that institution the experiments of Sir Humphry Davy on the subject, and which led him to advise the adoption of ship protectors; and, second, in consequence of the Niger expedition, fitted out to visit and endeavour to introduce civilization on the western coast of Africa.

The effect produced on copper sheathing by the presence of sulphuretted hydrogen in the waters on that coast, was, he premised, well known to every one informed

* *The Times*, June 5, 1841.

respecting vessels visiting it, and it was a fact that a cruise of nine months on the western coast of Africa injured the copper sheathing of a vessel as much as four years' wear in any other part of the world. The lecturer showed a piece of sheathing taken from the bottom of a Government frigate that had not been many months on the African station, and also a piece from the Royal George, sunk at Spithead, and which had been under water 60 years; the former was eaten through in very many places, and so thin all over that he might push his thumb through it, while the latter was tough and in excellent condition. His attention had been directed to the subject by the Lords of the Admiralty sending him 10 bottles of water, from as many different places on that coast, extending from 8° north of the Equator to 8° south, to analyse, and to report on the component parts thereof; and the accompanying table was the result:

	Sulphuretted Hydrogen, cubic ft.	in.	Saline Matter. grains.
Sierra Leone, per gallon	6	18	1,696.0
Volta . .	6	99	2,480.0
Bonny River .	1	21	1,778.0
Moony . .	..	..	2,104.0
Gaboon . .	..	..	2,169.0
Lobez-bay .	11	69	2,576.0
Congo River (Mouth)	0	67	188.0
Congo River (35 m. inland)	..	..	8.0
Bango . .	4	35	2,736.0
Lagos . .	14	75	1,920.0

All the bottles were hermetically sealed, and he had no doubt the water was in every way as good as when taken from the rivers. On drawing the cork, he was immediately struck with the smell of sulphuretted hydrogen, and adopted the general idea that it arose from animal and vegetable decomposition, but it had since appeared to him that such was not entirely the case. The gas extended a distance of 15° or 16°, and in some places as far as 40 miles to sea, covering therefore a space of 40,000 square miles. Now what could the origin be? He thought that it arose from the action and re-action of vegetable and animal matter brought from the interior by the rivers upon the sulphates in the sea-water. With this idea he gathered last autumn some leaves from a shrubbery and put them into three jars; into one of which he poured some plain New River water; into the second, some of the same water in which three ounces of common salt had been dissolved, and into the third, the like water, in which some crystallized sulphate of soda was dissolved. To the covers of the jars he fixed inside some litmus paper, and placed them in a cupboard, the temperature of which varied from 70 to 100 or 110 deg. The effect was, that in the first the litmus paper was perfectly white, and the smell by no means unpleasant; in the second the paper was quite white, and the smell similar to that of a preserve; but in the third jar, in which a sulphate was present, the paper was nearly black, and the stench was horrible and nauseous in the extreme, as every one knew the smell of sulphuretted hydrogen gas to be. Now sea-water contained sufficient sulphates to produce this effect, under peculiar circumstances.

But a more interesting part of the subject was the miasma so injurious to life on the marshy shore of Western Africa. Some persons said that if science cannot point out a remedy, it is useless to investigate the causes, but he did not so think; if science could not point out a remedy, still it could point to something as a palliation of the evil. The presence of the injurious gas was easily tested by the roughest hand, so that places in which it abounded could be avoided; and if imperative duty rendered it absolutely necessary to go to those places, then plentiful fumigations of chlorine gas would effectually destroy the sulphuretted hydrogen. The effect of this gas was not only visible on the Western coast of Africa, but in many places elsewhere, although not to so great an extent. Might not the jungle fever of India, the periodical fevers of New York and Charleston in America, and the minor diseases on the coast of Essex, be traced to be effects of this deleterious gas? It was a well known fact that the ships in the mouth of the Medway consumed more copper than other ships.

Chlorine gas then destroyed the injurious gas, and it was easily made, and the materials very cheap; the Government had plentifully supplied the African Expedition with the materials necessary for the most perfect chlorine fumigations, and he had the pleasure of believing that his report founded on the analysis of the waters submitted to him, and the precautions taken, had imparted confidence not only to the gallant men who composed that expedition; but also to those who had interested themselves in its welfare, and who had been actuated by the most Christian spirit. He hoped its success would be commensurate to its deserts.

EXPERIMENTAL RESEARCHES ON THE PRODUCTION OF SILICON FROM PARACYANOGEN.

BY SAMUEL BROWN, M.D. EDIN.

In a former paper, this distinguished chemist intimated that he had been led to infer from experiment, that two familiar substances, long universally regarded as distinct elements, are in reality only modifications of

* *Edin. Monthly Journal of Med. Science*; June, 1841.

the same material form; and having extended his inquiries, he now maintains that carbon and silicon are isomeric substances. The present communication is of a purely practical character, the author having refrained from presenting what he conceives to be the rationale of the singular facts he has just discovered, until farther investigations of a similar kind shall have been executed by himself and others. The manner in which the author establishes the isomerism of carbon and silicon is very simple, and consists in giving a great many processes by which the former may be converted into the latter. These are contained in a series of five sections: the first treats of the production of silicon from free paracyanogen, (N, C, C+N; C, C); the second, on the formation of mixed siliciurets of copper, iron, and platinum, by the re-action of paracyanogen; the third of the quantity of nitrogen separated from paracyanogen, when it is changed into nitrogen and silicon; the fourth describes processes for the preparation of transparent crystallized siliciurets of iron from the paracyanide of iron, and the ferrocyanide of potassium; and the fifth gives easy processes for the extraction of silicic from the ferrocyanide of potassium by the action of carbonate of potassa. It is impossible to convey an adequate conception of the manner in which those subjects are handled in the respective sections, in the form of an abstract. Suffice it that the author, having procured silicon, siliciurets, and silicic acid, in circumstances which appear to warrant the conclusion that the carbon of the compounds employed, had been tranformed into silicon, his chief care was bestowed on the attempt to discover some source of fallacy in his processes, *but in vain*. For example, one of the processes given in the last section is this: — Mix equal weights of anhydrous ferrocyanide of potassium and carbonate of potassa, and keep the mixture five hours (for 2000 grs. of the ferrocyanide) at a good heat in a well closed crucible of hammered iron; the product yields to water a mixed solution of cyanide of potassium, undecomposed carbonate of potassa, and silicate of potassa. The silicic acid may be separated by adding excess of hydrochloric acid, desiccation, ignition, and elutriation. But we must refer to the paper itself, about to be printed in the Transactions, for numerical and other details. It may be added, however, that the proof that the silicon of the silicic acid procured in the process which has just been mentioned, is not extracted from the iron crucible, is *twofold*; first, carbonate of potassa may be employed *alone* without producing any silicate, and that in the same crucible before and after the operation has been performed with the ferrocyanide of potassium; and secondly, the process may be repeated many times in the same crucible, and yet be invariably attended with the same result.

ON THE ATOMIC WEIGHT OF URANIUM.*

BY M. EUGENE PELIGOT.

Uranium, although it has been known for more than half a century, has been the subject of but few investigations: the properties of this metal are ill defined, although it presents many peculiarities worthy the attention of chemists.

Having at my disposal a great quantity of uranite, for which I was indebted to the kindness of M. Fontenay, proprietor at Autun, I undertook to study the principal compounds which this body produces. It is well known that the uranite of Autun is a double phosphate of uranium and lime, which, from its simple composition is better adapted than any other natural product for the extraction of this metal.

According to Arfwedson's experiments, confirmed by those of Berzelius, the atomic weight of uranium is represented by the number 2711·3. "This metal," says M. Berzelius, "has two oxides in which the multiples of oxygen are 2 and 3. There is reason to regard these oxides as U+O and 2U+3O, because uranium, although its specific gravity is not very great, has a very high atomic weight."

As this atomic weight was fixed without the analysis of one of the salts formed by this metal having been made, I considered that it was necessary, in commencing these investigations, to determine the elementary composition of some of them: the acetate of peroxide of uranium appeared to me to be best for this purpose. This salt crystallizes in small transparent isolated prisms, easy to be freed of their mother water; its physical characters cannot leave any doubt of its homogeneity.

The analysis of this salt gave:—†

	1st experiment.	2nd experiment.
Carbon	11·27	11·30
Water	21·60	21·16
Peroxide of uranium..	67·30	

* *Comptes Rendus*, No. 17, April 26, 1841.

† The following are the details of the analysis:—

1st Analysis.	2nd Analysis.
2·000 acetate of uranium.	1·413 acetate of uranium.
0·433 water.	0·586 carbonic acid.
0·827 carbonic acid.	0·309 water.
0·854 acetate of uranium.	
0·575 yellow oxide.	

The determination of the carbon and water was made by using the process indicated by MM. Dumas and Stass. (See *The Chemist*, Vol. I. No. XI. page 329, and No. XV., page 65.)

Now, admitting that the salt analysed contained 1 equiv. of acetic acid and 2 equiv. of water, and adopting the atomic weight of carbon of MM. Dumas and Stass to ascertain, by calculation, that of oxide of uranium, it will be found that it may be represented by the number 1800, as the following formula expresses:—

C^6	300·0	11·26
H^{10}	62·5	21·09
O^5	500·0	
Oxide of uranium..	1800·0	67·65
	2662·5	100·00

As it is very probable, from analogy, that this acetate may contain a base containing 100 parts of oxygen, the atomic weight of uranium, if these experiments are accurate, should henceforth be represented by the number 1700.

The formula of the salt analysed would be therefore

$$C^6\,H^6\,O^3,\ UO,\ 2HO;$$

while, according to M. Berzelius, it is represented by

$$3(C^6\,H^6\,O^3,\ 2HO)\ U^2\,O^3.$$

I should also remark that this formula requires that 100 of acetate should yield 68·8 of oxide of uranium, 10·8 of carbon and 21·4, numbers which differ so much from those furnished by direct experiment, that it is impossible to adopt them.

The analysis of crystallized nitrate of uranium led to the same conclusions: the composition of this salt, of which I directly determined the nitrogen, water and oxide of uranium, would be represented by the formula

$$NO^5,\ UO,\ 6HO.$$

If the peroxide of uranium is U O, the protoxide would probably be U^2 O. Uranium, therefore, would present the same relation in its degrees of oxidation as copper.

The composition of this protoxide, which was directly ascertained by Arfwedson, by reducing that oxide with hydrogen, certainly does not agree with this supposition: that chemist found that in it 100 of uranium are combined with 3·55 of oxygen, whilst, according to the atomic weight deduced from the above analyses, 100 of uranium should take 2·90 of oxygen.

But Arfwedson himself remarked that his experiments were deficient: it is not probable that he had obtained pure protoxide of uranium; for this body has a great tendency to peroxidize, and it does not appear that Arfwedson took account of this circumstance. Besides, the composition assigned by this chemist to the peroxide does not quite agree with those which result from the modification that I propose for the atomic weight of the metal. Indeed 100 of uranium are combined with 5·53 of oxygen in the peroxide, if the old atomic weight be admitted: with the new, 100 of uranium take 5·80 of oxygen to produce the same body.

I hope soon to present to the Academy a work on Uranium, in which these various questions will be directly resolved.

A NEW CHLORIDE OF BARIUM, WITH A PROCESS FOR OBTAINING THE PROTIODIDE OF BARIUM.*

BY REUBEN PHILLIPS.

The perchloride of barium may be procured by neutralizing the peroxide of barium with dilute hydrochloric acid, and dissipating the water by heat. It is a white substance, and not deliquescent; it evolves chlorine at a red heat, being converted into the protochloride. When concentrated hydrochloric acid is poured on it, chlorine is disengaged. Hydriodic acid also decomposes it; ammonia separates from its aqueous solution hydrated peroxide of barium. If a solution of perchloride of barium be mingled with a solution of iodide of potassium, no decomposition take place; but if a small quantity of hydrochloric acid be added, so much diluted as not to act on the pure perchloride, reciprocal changes of constitution instantly ensue, and iodine is abundantly precipitated.

This fact, as well as the decompositions effected by the hydriodic and hydrochloric acids, appear to favour the notion, that the peroxide of barium dissolves in hydrochloric acid without decomposition, and that it is the oxygen of the peroxide that deprives the hydracids of their hydrogen.

The protochloride of barium when dissolved in water, is completely thrown down by concentrated hydrochloric acid.

The periodide of barium is not so easily formed, for on pouring dilute hydriodic acid on the peroxide, a decomposition succeeds, whence results much of the protiotide: that the fluid contains some of the periodide is, I think, certain, from its precipitating iodine on the addition of hydrochloric acid; on evaporating the water by a steam heat it becomes simply protiodide of barium.

The following is my process for obtaining protiodide of barium:—

Add water to the sulphuret of barium, and continue to add iodine, and to stir the mixture until the fluid is slightly colored with a small quantity of free iodine. The solution

* Communicated by the Author.

should not be too concentrated, as it is then apt to retain traces of sulphur. After it has been filtered, the water may be driven off by heat. This method is probably applicable to all the soluble sulphurets, and doubtless, bromine may be substituted for iodine.

At a heat below redness, oxygen separates iodine from the iodide of barium, producing the peroxide. Peroxide of barium, iodine, and water do not act on each other.

NEW TEST FOR NITRIC ACID.

To the Editors of The Chemist.

Brunswick Square, May 6, 1841.

GENTLEMEN:—

I send you a short account of a new test for nitric acid, which I proposed some time ago; but not having had time to publish it before, I take this opportunity of making it public through the medium of your valuable journal, if you think it worthy.

The substance I propose is a double salt, which I call the *cyano-hydrargyrate of iodide of potassium*. It is formed by mixing cyanuret of mercury and iodide of potassium together in their equivalent proportions, and dissolving the salt in small quantities of warm water, which on cooling, deposits the salt in beautiful plates.

The use of this salt as a test depends upon the fact, that if one of its scaly crystals be put into most acids it immediately becomes of a beautiful red, being changed into biniodide of mercury, while in concentrated nitric acid, of specific gravity 1·4 to 1·5, the scale instantly becomes almost black, from the liberation of iodine. The effect is visible upon a very small scale of the salt. The acids which have been found to redden this salt, are the sulphuric, muriatic, hydrofluoric, chromic, phosphoric, and the common vegetable acids.

It has been found to blacken with chlorine, bromine, sulphuretted hydrogen, nitrous acid, &c.

The method of detecting the presence of a nitrate is to evaporate the solution to dryness, to introduce a small portion of the residue into a small tubulated retort, and pour upon it one or two drops of sulphuric acid, and apply a gentle heat, when a portion of the volatile products will pass over into the receiver with which the retort is to be connected, and in which one or two crystals of the salt have been placed. If they are blackened, the salt is to be considered a nitrate, provided the presence of those few substances which might cause the same effect has been guarded against.

By the method proposed, the presence of this acid will be at once detected; for the color of a chromate, the evolution of peroxide of chlorine from a chlorate, the liberation of iodine from an iodate, and the odour of a sulphuret, will at once decide with regard to each. I have tried this method of detecting nitric acid, and I am of opinion that it is quite as much to be relied on as the other tests, and indeed, provided all sources of error are avoided, I think it is superior to them.

I am, Gentlemen,
Respectfully yours,
C. W. B. A.

INVESTIGATIONS CONCERNING ESSENCE OF TARRAGON.*

BY M. A. LAURENT.

CRUDE essence of tarragon almost entirely consists of an oil which is volatile without decomposition. Its composition may be represented by the following formula:—

$C^{64} H^{40} O^2$ = 4 vol. of vapour.

Submitted to the action of boiling nitric acid, it yields the three following acids:—

Draconic Acid.—Crystallised in beautiful colorless prisms, volatile without decomposition. Its formula is

$C^{64} H^{36} O^{10} + 2$ Aq.

The two atoms of water may be substituted by two atoms of any base. This composition shows that the essence of tarragon has changed 7 equiv. of hydrogen for 7 of oxygen.

Nitro-draconasic Acid.—This body, which is crystallised and partly volatile, without decomposition, may also be obtained by boiling draconic acid with nitric acid. Its formula is

$C^{64} H^{34} N^2 O^{14} + 2$ Aq.

It represents draconic acid, one equivalent of whose hydrogen has been substituted by one equiv. of hyponitric acid.

Its two atoms of water may be substituted by two atoms of base.

Nitro-draconesic Acid.—It resembles the preceding: some of its salts catch fire in close vessels, when heated. Its formula is

$C^{64} H^{32} N^4 O^{16} + 2$ Aq.

It represents draconic acid, of which two equivalents of hydrogen have been replaced by two of hyponitric acid.

The two atoms of water may be replaced by two of base.

These three acids resemble one another in the highest degree; almost all their salts have the same solubility, and it is not without difficulty that they can be separated from one another.

Essence of tarragon, submitted to the action of chlorine, gives rise to an oily matter, which I call chloride of draconyle. Its composition is represented by the formula

$C^{64} H^{30} O^2 Cl^{14}$.

* *Comptes Rendus*, No. 18, May 5, 1841.

It shows that the essence of tarragon has changed 5 equiv. of hydrogen for 7 of chlorine.

I have proved in different memoirs that when a compound changes hydrogen for a greater number of equivalents of chlorine, a quantity of chlorine, or chlorine and hydrogen, may always be removed, either by distillation or by the alkalies, or that the new product contains as many equiv. as the body which gave rise to it. The action exerted by potassa on chloride of draconyle confirms this opinion. Indeed, I obtained chloride of potassium, and a new oil, which I call *chlorodraconyle*, and whose composition is represented by

$$C^{64}\ H^{28}\ Cl^{12}\ O^{3}:$$

that is, essence of tarragon of which 6 equiv. of hydrogen have been replaced by 6 of chlorine. Nitro-draconesic acid is isomorphous with draconic acid; the following formulæ, therefore, must be adopted for the preceding bodies:—

(I employ equivalents, and represent hyponitric acid by X.)

Essence of tarragon . .	$C^{32}\ H^{20}\ O^{3}$.
Chloride of draconyle . .	$C^{32}\ (H^{15}\ Cl^{5})\ O^{3} + Cl^{2}$.
Chloro-draconyle . . .	$C^{32}\ (H^{14}\ Cl^{6})\ O^{3}$.
Draconic acid	$C^{32}\ (H^{13}\ O^{7})\ O^{3} + 2$ Aq.
Nitro-draconasic acid . .	$C^{32}\ (H^{12}\ X\ O^{7})\ O^{3} + 2$ Aq.
Nitro-draconesic acid . .	$C^{32}\ (H^{11}\ X^{2}\ O^{7})\ O^{3} + 2$ Aq.
Salts of silver	$C^{32}\ (H, X, O,)^{20}\ O^{3} + 2$ Aq. O.

II. CHEMICAL MANUFACTURES.

SULPHURIC ACID, CONTAINING ARSENIC.

Sulphuric acid, made from iron pyrites, contains a quantity of arsenic, amounting to thirty or more grains in the pint. We have received numerous communications from the most authentic sources, informing us of the existence of the deadly practice of manufacturing sulphuric acid from this impure substance, which always contains arsenic in such quantity as to render the acid highly poisonous.

It is some two or three years since a patent* was taken out for making sulphuric acid from pyrites, and we are informed it is in use chiefly in Wales and in Scotland, where it is found in large quantities, and is very cheap.

Sulphuric acid, it is well known, is largely employed in the arts and manufactures, as well as in many processes connected with the production of domestic and medicinal compounds. One of its most extensive uses is the manufacture of soda, and as this is frequently used in culinary purposes, and given as medicine, some portion of arsenic it is probable may be contained in it, and prove of the greatest injury. Sulphuric acid is likewise very extensively used in producing soda water, as it is termed, for which purpose it is of the greatest importance it should be perfectly free from so injurious a substance.

We have merely advanced enough to caution our readers, and the public, against procuring sulphuric acid from any manufacturers who use pyrites in the process of obtaining the sulphate for this purpose.†

The methods of testing the acid are to dilute it, and subject it to the action of zinc in Marsh's apparatus, and to ignite the hydrogen gas as it escapes from the end of the tube. If the gas deposits any metallic spots, such as have been frequently described in *The Chemist*, upon the plate or glass, the acid must have contained arsenic, which has passed over in the form of arseniuret of hydrogen.‡

* As all patents are granted upon the condition that they are useful to the public, and this patent being not only not useful but dangerous, is such patent valid, and ought it to be suffered to be employed? If any more of the acid is sent to us, and is found to contain arsenic, we shall send it to the proper quarter to stop the nuisance. Soda powders, &c. are made in large quantities with the bi-carbonate of soda, and as the whole of the arsenic probably is not expelled with the hydrogen given out in decomposing the sulphate of soda, some arsenious acid may be contained in this preparation of soda, and become highly prejudicial to health.

† No doubt it is a fine speculation to get sulphur at a cheap rate from iron ore, though it may contain in a pint of acid as much arsenic as would kill a dozen people. We shall keep our eye upon the matter.

‡ Of course, as directed in all other cases, care must be taken to test the zinc before the acid is examined.

ON THE USE OF CARBONATE OF ZINC AS A PIGMENT, AS A SUBSTITUTE FOR WHITE LEAD.*

The great number of workmen who have been attacked with lead colic, through working in white lead manufactories, the death of some of them, and the symptoms observed in persons inhabiting apartments recently painted with white lead, have long attracted the attention of manufacturers and medical men, and we have been asked whether it would be possible to make use of the zinc residue, which might be procured very cheap at the place where the smelting of that metal is carried on, to obtain from it:—1st, hydrogen gas, which, by several chemical operations, could be rendered fit for lighting; 2d, sulphate of zinc, thus obtained very cheap, which might be converted into carbonate of zinc, to be used in painting.

The idea of substituting this salt for that of lead, which was published in the English work of Mr. Turner Thachrach, had already been published by the French philanthropists, and on a further examination into what has been done on this subject, we find that M. Courtois presented to the Academy of Dijon,† through M. Guyton de Morveau, some white zinc which, according to that chemist, possessed the following properties:—

It was unalterable, even by the strongest vapours (we understand by that, hydrosulphuric acid or its compounds), which immediately blacken Kremlitz white and every other species of white lead; it did not possess any of the bad qualities of the oxides of lead. It is known that the salt of zinc may be taken internally. White zinc mixes well with all colors, and may be used with both oil and water colors. It is remarked that it has the advantage of using less oil, and drying quicker than white lead.‡

Carbonate of zinc may be prepared in various manners.

1st. By precipitating a solution of sulphate of zinc by an alkaline carbonate; this process is followed in England in many manufactories; but as the sulphate of zinc of commerce is very impure, before employing it, its solution must be boiled with powdered or granulated sulphate of zinc: thus any metallic salts that this salt may contain, and which might injure its color, are decomposed; such as the sulphates of copper and iron, which it ordinarily contains.

2d. By calcining the sulphate of zinc in a crucible, the sulphate of iron, which is more easily decomposed, is converted into the insoluble sulphate of the peroxide and a small quantity of neutral sulphate of iron; but, as a small portion of oxide of zinc is separated at the same time, when the calcined mass is boiled in water, the oxide of zinc, which had been preipitated, reacts on the neutral sulphate of iron, combines with its sulphuric acid, and precipitates the oxide of iron. It is then filtered and precipitated by sub-carbonate of soda.

3d. By dissolving sulphate of zinc in a small quantity of water, adding a little nitric acid, and boiling it for a quarter of an hour, to peroxidize the iron, which is thus precipitated, cooling the liquor, treating it by an excess of carbonate of lime, leaving it for twenty-four hours in contact, filtering it and precipitating by sub-carbonate of soda.

Carbonate of zinc is also prepared in Germany; the following process is due to Herr Hermann:—

Zinc, or oxide of zinc, is treated by sulphuric acid: the solution is then subjected to the action of sulphuretted hydrogen, then treated by hydro-chlorate of lime; it is concentrated to separate the sulphate formed, and the hydro-chlorate of zinc which remains is precipitated by sub-carbonate of soda. The carbonate of zinc thus formed is washed and dried.

Other details on this subject are also found in printed works. There exist observations on carbonate of zinc, by M. Vincent de Montpetit, and a Report of the Committee of the Academy of Architecture, which we will give here.

OBSERVATIONS ON CARBONATE OF ZINC PROPOSED TO BE USED FOR PAINTING THE INTERIOR OF BUILDINGS INSTEAD OF WHITE LEAD.

BY M. VINCENT DE MONTPETIT.

It has long been known that oil painting in the interior of buildings has been the cause of diseases which have often proved fatal, and among others that known by the name of painter's cholic, the principal cause of which is owing, it is said, to the miasma emanating from the lead and its various compositions: it has also been ascertained that the white paints made from it give out vapours which are injurious not only to the workmen, but also to those who inhabit close places which have been recently painted.

It was therefore interesting to endeavour to substitute less deleterious substances for white lead: carbonate of zinc obtained the preference on account of its whiteness and its not being liable to alteration of color. The experiments which were repeated on this subject were submitted to the Royal

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* *Journal des Connaissances Necessaires et Indispensable; May*, 1841.

† A proof of this fact may be found in the *Tableau Raisonné de l'Histoire Litteraire du Dix-huitième siècle, Dec.* 1782, p. 146.

‡ It is said, however, that it does not cover so well as white lead.

Academy of Architecture, whose authentic approbation ought to excite the attention and confidence of the public in favour of this new pigment, inasmuch as it has been proved that it cannot, under any circumstances, give off vapours which are prejudicial to health.

It may, therefore, on account of its utility, be recommended to society. Unfortunately, its use is not yet very general, because at present, it is manufactured only in the chemical laboratory of the Academy of Dijon, and because it cannot be very cheap, as the material is brought from abroad. If the French mines were examined, those of Saint-Bel, in Lyons, of Pompeau, in Brittany, and others, in which zinc is found in great abundance, and if, instead of neglecting them, they were used for making carbonate of zinc, this would be the best means of turning it to account, and of opening a new branch of commerce, which would keep in the country a portion of the large sums of money sent abroad to buy white lead.

It would be highly advantageous, for humanity as well as commerce, to establish a manufactory combining all the means required for bestowing on the different classes of society the benefits resulting from the use of carbonate of zinc; for at the present time (1786), it is attainable only by the rich. The price of 4 francs per 500 grammes (one pound French) will always be an obstacle to its general use. It is, however, apartments whose interior should be painted with carbonate of zinc, such as those of vessels, ground-floors, habitations exposed to damp, and others, where a durable paint is desired.

REPORT OF THE COMMITTEE OF THE ROYAL ACADEMY OF ARCHITECTURE.

The committee appointed by the Royal Academy of Architecture, at its sitting of March 13, 1786, having examined a memoir of M. De Montpetit on the advantages of substituting carbonate of zinc for white lead in painting, made the following report: —

"The prejudicial effects of the various preparations of lead in oil and colour painting are well known. It appears to us that nothing ought to favor the employment of a substance which renders apartments injurious to health for a very considerable time, and whose effects, although slow, and often attributed to other causes, are not the less real and terrible when they attack persons of a weak and delicate constitution; but it is wished to please the eye, and that at as low a price as possible. Hence, it is that from preference the use of white has so long been continued, notwithstanding the danger.

"We are indebted to M. Morveau for numerous and interesting experiments on carbonate of zinc. They were made at the Academy of Dijon, and repeated at Paris. It may be concluded from these experiments, whose results were exhibited to the company, that carbonate of zinc has two very great advantages over white lead.

"The first is, that it contains no substance whose emanations can be injurious to health; the second, that it always retains its brilliancy and whiteness, because experiments made by exposing it to the vapour of sulphur, showed that it could not be altered by substances which evolve hydro-sulphurous vapours.

"Indeed, it yields in whiteness to the best white lead; but this advantage is of no great consideration, since the best white lead is always susceptible of being reduced, and of acquiring a blackish tint on contact with any substance containing sulphuretted hydrogen, and since it costs 5 or 6 francs per pound. (In 1786).

"The specific gravity of the carbonate of zinc must be taken into consideration; that salt, costing only 4 francs per pound, covers at least one-third more surface. It is evident, therefore, that on account of its durability, there will always be a real advantage in employing it, even at the present price.

"We cannot dissemble that the difference of the price of white lead and carbonate of zinc for painting buildings does not raise the price of the same surface in the proportion of 1 to 3, and that this proportion is no less unfavorable to white lead; but as it must be observed that we gain in whiteness, and that this difference is greatly owing to the present price of zinc, there is every reason to hope that this price will be considerably lowered if a large establishment be formed. Such an establishment would be very useful and agreeable to those who know the value of health, and how much we ought to desire to see the number of causes which tend to injure it diminished.

"Moreover, it might reasonably be expected that new combinations of this pigment with other substances will diminish the expense of painting buildings, provided these mixtures be made with the care and precautions prescribed by M. Montpetit.

"We think, therefore, that we cannot but praise the zeal of the author of this memoir, in repeating the interesting experiments of the Academy of Dijon. Besides, as we have in this kingdom mines where zinc is found in abundance, it would open a new branch of commerce and national industry, that of favouring the manufacture, on the large scale, of this salt, which has none of the objections to which the preparations of lead are liable. It cannot be doubted that one should hasten to adopt it in all cases

even if works on a large scale should reduce the price of the preparations of lead in use under the same circumstances.

"Thus we think that the Academy will adopt the praises which we think due in all respects to the useful views and multiplied works of the author of the memoir.

(Signed) Mauduit.
Bossut.
Cherpitel Antoine."

Again, quite recently (in January, 1841,) we were in a situation to prove the action of sulphuretted hydrogen and the hydro-sulphates on oil paintings, and particularly in that applied in the neighbourhood of Montfaucon: painting of a greyish white had first turned black, then scaled and was partly detached: the parts which did not fall were removed, and presented on the two surfaces swellings and furrows so strongly marked, that it might, at first sight, have been taken for a product obtained by fusion. Submitted to the action of heat, we first obtained products analogous to those of painted wood when burned and afterwards treated by sulphuric acid.

In conclusion, without thinking that carbonate of zinc may be entirely substituted for carbonate of lead, we do think that it might be very useful in oil preparations.

INDELIBLE INKS.

To the Editors of The Chemist.

Gentlemen:—

The perusal of a letter in No. XVII. of your journal, containing a formula for the preparation of the Marking Ink of the shops, has suggested the idea, that a short paper on the subject, may prove interesting both to the trade and the public.

The fluid spoken of by your correspondent is simply a solution of the oxide of silver in liquid ammonia, to which a little coloring and gum are added, for the purpose of rendering the marks of the pen legible, before the ammonia is volatilised, and to prevent the surface of the writing from spreading. The proportion of each article is of little consequence, the necessary qualities being—sufficient fluidity to run easily from the pen, and a good depth of color after exposure for a few days. This preparation has, however, no claim to the title of "Indelible Ink"—"which no art can extract without injuring the fabric"—as is generally represented. On the contrary, it may be discharged with almost as much facility as a common iron-mould. This may be easily and cheaply effected with either chlorine or ammonia, without in the least injuring the texture of the fabric to which it may be applied. From a great number of experiments which I have lately made on the subject, I find that this ink may be discharged from even the finest muslins, without impairing their quality. The only precaution required, is that of rinsing them in clean water, immediately after the operation.

Another preparation which was formerly the only marking ink of the shops, and which is, even now, frequently met with, consists of a solution of nitrate of silver in distilled water, in the proportion of one part of the former to five of the latter, by weight, and, like the previous article, is colored with sap green, and thickened with gum. Before writing with this fluid, the linen is to be prepared with a weak solution of carbonate of soda slightly stained with sap green or syrup of buckthorn, to which a very minute quantity of mucilage is added. In many points this ink is much superior to the former, as it spreads less, and unites itself more firmly to the fibres of the linen, but like all writing fluids of this description it may be easily discharged, in the way before mentioned. It is difficult to conceive the reason why the trade and the public entertain an affection for such expensive preparations. A solution of indigo or ferrocyanide of iron is much more permanent, and much less expensive, while even common black ink or copperas water will impart a stain capable of resisting the action of the alkalies and soap employed by the laundress, and would consequently prove equally useful with the nitric solution, if this be the only quality required in common marking ink. I have an article of dress, that was prepared with a mordant of protosulphate of iron, and afterwards written on with a solution of ferrocyanide of potassa, and which has been subjected to repeated washing and boiling, without at all impairing the colour of the writing. The juice of sloes, thickened with a little gum, is also an old form, and very durable. But none of these fluids, or any others of a similar description, can lay claim to the title of "indelible."

If we want an ink capable of resisting the action of the usual chemical agents, either for the purposes of the manufactures and arts, or preventing fraud, we must seek for other preparations than mere metallic or vegetable solutions. This property will be found in a composition first recommended by M. Haussman, and which is permanent under the action of chlorine, the alkalies and the acids, even in a state of considerable concentration. It is extensively employed in the arts, and has been found capable of resisting all the operations of dyeing and bleaching, and at once offers a cheap and excellent material for marking linen, &c. This ink is formed by dissolving one part of genuine asphaltum in four parts of oil of turpentine, and adding to the mixture a sufficient quantity of lampblack, or finely pow-

dered black-lead, to render it suitable for printing. The plan of marking with stamps or types is much neater than the common method of employing a brush or pen. Mr. Sheldrake has proposed a similar mixture, but prepared with amber varnish instead of turpentine, or a mixture of the two.

The following formula has been constantly given in chemical books, and is highly recommended by Mr. Close, but is very expensive.

Take powdered copal, 25 grs.
Oil of lavender, 200 grs.
dissolved by a gentle heat; then add
Lampblack, 2½ grs.
Indigo, ½ gr.

A larger quantity of colour than here mentioned improves the ink.

Another formula on the same authority is

Powdered copal, 1 part
Vermillion, 4 ,,
Oil of lavender, 7 ,,

All these preparations are strictly "Indestructible Inks," as far as the term may be reasonably applied, and whether employed for lables for bottles containing caustic fluids, or for marking textile fabrics, will sufficiently bear out the title. It must, however, be confessed, that the last two recipes, though so much esteemed by many persons, possess no advantage over the simpler and cheaper ones formed with asphaltum: in fact, they are inferior in many respects. I feel much pleasure in stating, that from my own experience, I can confidently recommend the formulæ of M. Hausman and Mr. Sheldrake, as possessing every necessary quality.

I have also employed a mixture of the following materials with great success:—

Asphaltum, 1 part.
Oil of turpentine, 3 ,,
Best Printer's Ink to colour.

But I fear I am trespassing too far on your columns, and will therefore conclude. At some future time I may notice the preparation of writing fluids for paper and parchment.

I am, Gentlemen,
Respectfully yours,
A. J. Cooley.

London, June 3d, 1841.

ON THE PROCESSES FOR RENDERING TISSUES UNINFLAMMABLE.*

BY M. MORIN.

The idea that tissues might be rendered uninflammable by means of an incombustible mineral substance has long been entertained.

It has been ascertained that heat applied to an organic substance covered with an incombustible substance, acted by disorganizing it, as distillation in close vessels would do, and destroyed it.

But the necessary result of this destruction being the production of a large quantity of gases containing more or less carbon, and of a more or less combustible and inflammable nature, we cannot but doubt the real efficacy of the means employed for rendering the tissues uninflammable.

An opportunity of making some experiments on this subject having presented itself, I seized it with the more haste, as they were to be made on a large scale. The subject of the experiments was the sail of a steam-boat, exposed to the rain, and to receiving burning coals. It was a large hempen cloth.

At first I tried the effect of soluble glass charged with various proportions of silica, and among others I tried that of Fuchs, which was used for the decorations of the theatre at Munich, and which is soluble only in warm water.

A piece of stuff was impregnated with the vitreous solution, and dried. The same operation was repeated several times before it attained the point when, exposed to the action of a bright flame it reddened and was decomposed without being inflamed.

I found that by several times handling the stuff thus rendered uninflammable, it entirely lost this property, which I could attribute only to the vitreous covering with which it was saturated having dried and not having contracted any adhesion to the tissue, and being applied to it only like a powder which fell off every time it was moved.

It would, therefore, be interesting to know whether the management of the theatre at Munich has found it necessary to renew this vitreous solution in the decorations which are moveable, and, if not, whether they do not reckon on a property which these decorations no longer possess.

Once convinced that soluble glass had no other property than that of impregnating the cloth with a dry and friable mineral substance which may be detached under the form of a powder, it appeared to me that any concentrated saline solution with an insoluble base, and whose base might be precipitated on all the internal and external parts of the tissue, would produce analogous effects to those of soluble glass, and these means would have the advantage of economy and of facility of preparation for all moveable hangings and which are likely to be knocked about, however, acknowledging the superiority of soluble glass for all fixed objects.

If it had been required for cloth sheltered from the air, I could have dispensed with precipitating the saline solution. The

* *Journal de Pharmacie*, May, 1841.

salt lodged in all parts of the tissue would render it incombustible, and in support of this view, I may mention the difficulty experienced in burning wooden vessels which have contained salt, especially sea-salt containing muriate of magnesia, a deliquescent salt which easily penetrates into the pores of the wood.

Cheapness being a *sine qud non*, the choice of substances which I could use was very limited.

I first tried alum. After having steeped the cloth in a concentrated bath of that salt, I dried it and immersed it in a very dilute bath of ammonia, to precipitate the alumina. I repeated this operation several times, and when I considered the cloth sufficiently charged with alumina, I dried it. Cloth thus prepared burned little less easily than before.

I succeeded no better by employing two successive baths of muriate of lime and carbonate of potassa, producing carbonate of lime by their decomposition.

From the very remarkable property of alum, of fixing colors on certain tissues, which, without that intermedium, would be destroyed or removed by washing in water, I had hoped to find in alumina in a body capable of contracting a certain adherence to cloth. This view not being confirmed, I gave up earthy preparations: I then tried metallic preparations, several of which form chemical compounds with most organic substances.

I first tried basic acetate of lead, and I effected the precipitation by three different bodies, namely; muriate of ammonia, ammonia, and alum. By the first process, I charged the cloth with muriate of lead, by the second, with oxide of lead, and by the third, with sulphate of lead.

These three samples, dried, did not inflame, although held for a long time in the flame; but they burned slowly, and when one part became incandescent, the fire was slowly propagated throughout the stuff, as well as prepared tinder would have done.

Finding in the preparations of lead but some of the properties which I required, and a very serious inconvenience, I tried zinc. After having charged the cloth with a large proportion of sulphate of zinc, I precipitated the oxide by ammonia.

The sample obtained did not inflame. It might be burned, but the combustion was not propagated unless it was supported by a fire.

Having found in oxide of zinc the properties which I desired, I adopted it on a large scale. The following are the proportions which I found best adapted:—

For 45 pounds of cloth, I employed 16 pounds of sulphate of zinc and 36 pounds of water, and I precipitated the oxide from it by 6 pounds and a half of ammonia, at 16 degrees, mixed in a large quantity of water in which I dipped the cloth several times. The tissue was covered with 5 or 6 pounds of oxide of zinc, or $\frac{1}{3}$ of its own weight.

This preparation, however, had the same defect as that which I had noticed above; and as the samples brought from Paris by M. de Saussure also presented, that of being washed out with water; a very serious objection, especially for a sail exposed to rain.

To fix the preparation of zinc, or anything else, in a more solid manner, I tried the property which tannin possesses of rendering gelatine insoluble. For this purpose, I first charged the tissue with the mineral substance to render it incombustible; then, after having dried it, I impregnated it with a solution of size, and finally I passed it into a bath containing tannin. Although the preparation for rendering the tissue uninflammable, was rendered more tenacious by these means, it did not resist repeated washing.

It is evident, therefore, that processes like those which I have pointed out, do not indefinitely preserve tissues exposed to wet, and that it is necessary now and then to replenish them with mineral matters to retain their incombustibility.

It is the same with tissues liable to be knocked about or folded. All these motions cause some of the mineral matter to fall off, and after a time, the tissue, being charged with too small a quantity of incombustible matter, can be inflamed. However, this is effected not so quickly as by washing.

For the preservation of fixed tissues, papers, or wainscots, the vitreous varnish perfectly answers the purpose.

In some cases, a deliquescent salt might be the most advantageously used; muriate of lime for example.

Finally, these different substances seem to have no other mode of action than by rendering the combustion so slow that the gases produced by the decomposition of the organic matter do not engender flame. We may conceive, therefore, that, by their agency, the organic matter will easily resist a feeble source of fire; that a spark or a hot cinder may make a hole in it, without causing the combustion of the whole. But if the source of heat be sufficiently strong to produce immediate decomposition of a great quantity of organic matter, the product of gas will, consequently, be considerable, and instantaneous, and the matter may even be inflamed. Uninflammability will not, therefore, be absolutely obtained, but it will be relative to the intensity of the source of heat.

COLORS OBTAINED WITH THE DAGUERREOTYPE.

To the Editors of The Chemist.

1, Castle-street, Dover, Kent.

GENTLEMEN:—

Permit me to trespass a little on your valuable space by informing you and your numerous readers that, after many months of expensive and repeated trials, I had the satisfaction, on the 23d of April last, to obtain three most distinct and perfect colors, by the Daguerreotype. But the process I employed being very different from that laid down by M. Daguerre himself, I beg to be permitted to call my new method "PHOTOCHROMY."

That what I advance may not be doubted, I beg to say that I showed my first successful result,—the Cottage in Eastbrook Place, occupied by Mr. George Jennings, a worthy magistrate of our town, which I took from my own drawing-room,—to the most celebrated chemist, and one of the best geologists of this town—I mean Mr. Dean, of Beach-street, and Mr. Lambert Weston, both of whom greatly admired this beautiful picture. Mr. Wright, the engineer at the railway office, a most scientific character, has also seen it. Should I be fortunate enough to obtain more of the colors, it will afford me pleasure at some future period to publish the process. It is more than a year since I obtained tolerable portraits from nature. The arrangement in the machinery being my own, I hesitate not to mention a circumstance well known to some of my Dover friends.

Should this hasty communication be deemed worthy of insertion in your excellent publication, to which I am a subscriber, you are at liberty to do so.

I remain, Gentlemen,
Your humble and obedient Servant,
J. P. SIMON, M.D.

III. PHARMACY, &c.

LAWS OF THE PHARMACEUTICAL SOCIETY OF GREAT BRITAIN,

PASSED AT THE MEETING OF THE SOCIETY, HELD AT THE CROWN AND ANCHOR TAVERN, JUNE 1ST, 1841.

THE PHARMACEUTICAL SOCIETY OF GREAT BRITAIN is instituted for the purpose of uniting the Chemists and Druggists into one ostensible, and recognised, and independent body—for protecting their general interests, and for the advancement of Pharmacy, by furnishing such a uniform system of education, as shall secure to the profession and the public, the safest and most efficient administration of medicine.

CONSTITUTION.

The Members of the Society shall consist of,

1. Chemists and Druggists who are, or have been established on their own account, and who shall severally subscribe the sum of Two Guineas annually;

2. Confidential Superintendents, who shall be elected by the Council, and who shall severally subscribe the sum of Two Guineas annually.

(*The sum of Twenty Guineas, subscribed in one payment, shall be received in lieu of the annual subscription.*)

Honorary and Corresponding Members, comprising such medical and scientific men as have distinguished themselves in any of the branches of knowledge embraced in the Educational objects of the Society, shall be elected by the Council, but shall not be allowed to be present at any General Meeting.

Associates.

Assistants shall be admitted as Associates who shall pay the sum of One Guinea annually; and shall be entitled to all the benefits of the Society, excepting the right to be present at any of the General Meetings, or to hold any office in the Society.

Apprentices.

Apprentices who shall be duly registered, and who shall pay the sum of One Guinea annually, shall have the privileges of Associates.

EDUCATION AND EXAMINATION.

The Educational Objects of the Society shall embrace the followings subjects:—An Elementary Classical Education—Medical Botany—Chemistry—Materia Medica—and Pharmacy.

After the 1st of July, 1842, no person shall be admitted as a Member, or an Associate of the Society, without having passed an examination in the above branches of knowledge; and after that period no Apprentice shall be entitled to the privileges of an Associate without having, before the execution of his indentures, passed an examination in Classical Education. The said examinations and the registration of indentures shall be subject to the payment of such fees, and the granting of such certificates, as the Council may, from time to time, determine. But all present Assistants and Apprentices, who

shall be registered before the above date, shall be exempted from the above restrictions, and shall be eligible as original Members, when they shall have commenced business on their own account.

It shall also be in the power and discretion of the Council to admit as Members, without examination, after the above period (upon the payment of an entrance fee) such Chemists and Druggists as have been actually in business on their own account, prior to the above date, but who may have neglected to become Members.

ELECTION AND POWERS OF COUNCIL.

The government of the Society shall reside in a Council of twenty-one, composed of a President, Vice-president, Treasurer, and eighteen others.

The Council shall be annually elected by and from among the Members of the Society; one-third of which shall consist of Members of the last year's Council. The President, Vice-President, and Treasurer, shall be chosen by and from among the Council, who shall also appoint a Secretary, being a Member of the Society.

There shall also be elected, at the same time, by and from among the Members of the Society, Five Auditors; three of whom shall be required to inspect and sign the accounts, at least fourteen days previous to their being submitted at each Annual General Meeting.

Any Member desirous of nominating another to any office, must express the same in writing to the Secretary, at least six weeks before the day of election, being previously assured that such member named will accept the office, if elected.

The Council, of whom seven shall form a quorum, shall meet monthly, for the admission of Members and Associates and for the despatch of business; and shall keep a fair record of their proceedings; but Special Meetings may be held on the requisition of the President or any five Members.

The Council shall appoint Examiners and Lecturers, and shall regulate the extent of examination, as from time to time may be necessary; and shall provide a library, museum, laboratory, &c., as may hereafter become practicable, and shall render an account, once in every year, of the receipts and expenditure of the Society.

The Council shall have power to elect, as Members of the Society, such persons engaged as confidential Superintendent, as may, by their acquirements, be calculated to improve the art and science of Pharmacy, or advance the interest of this Society: they shall also elect Honorary and Corresponding Members.

The Council shall make such bye-laws as shall be requisite, and shall avail themselves of all practicable means for promoting the general interests of the Society, and protecting its members.

FINANCE.

The Funds of the Society shall be derivable from donations to General Purposes; Subscriptions of Members, Associates, and Apprentices, as well as fees upon examinations and registrations.

All annual subscriptions shall become due on the 1st of January; and if not paid by the 25th of March, the defaulter shall cease to be a member: but the Council shall have power to re-admit, upon a reasonable explanation, and payment of a suitable fine.

The Council shall have power to disburse the funds of the Society in payment of salary to Secretary, fees to Lecturers and Examiners, Premises, formation and extension of Museum and Library, Philosophical and Pharmaceutical Apparatus, Laboratory, Premiums for discoveries in Chemistry, and improvements in Pharmacy, servants' wages, and any other requisites for accomplishing the objects of the Society.

The financial affairs of the Society shall be conducted by the Treasurer, who shall duly account to the Council, once in every month, or oftener if required, for all monies received and expended.

All monies or other property shall be vested in the Council.

THE BENEVOLENT FUND

Shall consist of donations and subscriptions made for that specific purpose, aided by such appropriation of a portion of the general funds as the Society at their annual meeting shall think necessary.

All distressed Members and Associates of the Society shall be entitled to relief at the discretion of the Council; and all distressed widows and orphans of Members and Associates shall be in like manner the objects of this fund.

GENERAL AND SPECIAL MEETINGS.

A General Meeting of the Members of the Society shall be held on the third Tuesday in May, in each year, to receive the report of the Council, and to discuss any matters of importance which may require the attention of the body at large; at which meeting the Council and Auditors shall be elected, by ballot, for the twelve months next ensuing.

The President or Vice-President shall act as Chairman of all public meetings; or, in their absence, the members then present shall elect a chairman from among the Council.

The Council shall call a special general meeting of the Members of the Society, whenever they shall see fit, or on the requi-

sition of thirty members, entitled to vote, and the Council shall give ample notice of the said meeting, and of the business to be considered. At such special meeting the only business, after the chair is taken, shall be the consideration of the special matter for which the meeting is called; but no member shall vote in any meeting, unless he shall have paid all subscriptions at that time due.

Any thirty members, duly qualified, desirous of expunging or altering a law, or proposing a new one, must deliver to the Secretary the proposition in writing, with their signatures attached, at least three months before the annual meeting next ensuing, and the Secretrary shall give one month's notice of such proposition to the members of the Society.

REPORT OF THE COMMITTEE UPON THE LAWS OF THE PHARMACEUTICAL SOCIETY OF GREAT BRITAIN.

Agreeably with your instructions, and in conformity with the principles laid down in the last Report, your Committee have prepared the fundamental Laws of the Pharmaceutical Society in such a manner as shall leave to every one, whether Principal, Assistant, or Apprentice, all rights and privileges enjoyed by his predecessors; whilst regulations are proposed which shall assure to the public and the profession, the competence of such Chemists and Druggists as shall be Members of this Society.

The unanimity which prevails among Chemists and Druggists upon the expediency and necessity of establishing an Association for the purpose of protecting their interests, induces the Committee to hope that the same unity of sentiment will prevail in carrying out the details of this important measure.

The influence which Chemists and Druggists possess as a body when their efforts are combined, has been demonstrated in a manner which affords every encouragement to perseverance. It is equally manifest that if they relax in their exertions, or allow any minor considerations to interfere with the zealous and harmonious performance of the duty which they owe to themselves, they will inevitably sacrifice their independence, and be deprived of many of their existing privileges, by becoming subject to extraneous jurisdiction. It must be recollected that the Society is of a PUBLIC nature, and involves the prosperity of Chemists and Druggists as a body throughout the kingdom. It is only by the combined and continued efforts of individuals that a scheme so comprehensive and laborious can be effected; and these efforts to be successful, must be supported by all those who are interested in its accomplishment.

In drawing up the fundamental regulations of the Society, your Committee have carefully guarded against the possibility of those abuses which have often arisen in similar institutions; and, while they have vested in the Council sufficient powers to render their services effective, they have made them entirely responsible to, and to be elected by the members at large.

To Chemists and Druggists now established, this Society offers the means of extending Pharmaceutical knowledge by the establishment of a recognised medium through which discoveries and improvements may be promulgated; whilst the institution of a School of Pharmacy—the development of scientific acquirements, and the exhibition of existing talent, will tend to confirm the confidence of the public, and remove our apparent deficiency as Pharmacopolists, when compared with other nations.

To Assistants it will afford the means of practical improvement, and an opportunity of obtaining honorary distinction.

To Apprentices the Society offers an immediate recognition of their admission to the trade, and holds out a sufficient inducement for industrious and studious habits, by affording the prospect of participation in the elevated position and character which will hereafter appertain to those who practise Pharmacy.

The course of education proposed, embraces only such subjects as should be known by every person presuming to dispense prescriptions; and though at the outset it would not be stringently enforced, it will be the duty of the Council to extend the examination as circumstances may require.

By the regulations under the head of Education and Examination, all existing Chemists and Druggists have the opportunity of escaping any restriction or ordeal which may be imposed upon their successors; and in order to enjoy this exemption, nothing is demanded from them but that they shall unite in supporting an institution which the protection of their interests has rendered necessary.

The establishment of an examination in the Classics, for all future Apprentices, will ensure the possession of that preliminary education which is essentially necessary for the creditable performance of their duties, and their ultimate success as Pharmacetists; and the increased importance and respectability which will be conferred upon Pharmacy by means of the Society, will induce many of the more wealthy classes to devote themselves to its pursuit.

In order to establish among the Chemists and Druggists of the empire a substantial and permanent bond of union, and also to

supply a deficiency which has hitherto existed, your Committee recommend the foundation of a fund for the relief of the distressed, the widow, and the orphan: and, taking encouragement from the example and success of other bodies, they trust that this collateral object of the Society will obtain universal support.

The Committee have the satisfaction of stating that a communication has been received from Paris, intimating a desire, on the part of some of the leading Members of the Society of Pharmacy in that city, to establish a scientific correspondence with "The Pharmaceutical Society of Great Britain;" and overtures of a similar character have been made on behalf of the College of Pharmacy in Philadelphia. The Chemists and Druggists of Scotland and Ireland have also expressed considerable interest in the undertaking.

Your Committee, therefore, congratulate you on the circumstance, that, although the Chemists and Druggists of Great Britain united in the first instance merely for the purpose of self-defence, in support of their acknowledged rights, that union has resulted in the creation of a National Institution for the advancement of Pharmacy, which will be enabled to carry on a correspondence with similar institutions throughout the world.

The establishment of such correspondence —the formation of this Institution—and the successful result of the opposition to the bill of Mr. Hawes, will ever be regarded by your Committee as a gratifying recompence for their past exertions.

JOSEPH GIFFORD, Chairman.

At a General Meeting of the Members of "The Pharmaceutical Society of Great Britain," held at the Crown and Anchor Tavern, Strand, on Tuesday, the 1st of June, inst., R. H. PIGEON, Esq., in the Chair, the Report of the Committee having been read, it was

Moved by Mr. Savory, seconded by Mr. Morison, and

Resolved unanimously — That the Report now read be adopted and printed for circulation.

The Laws of "The Pharmaceutical Society" having been submitted to the Meeting, it was

Moved by William Allen, F.R.S., seconded by John Bell, and

Resolved unanimously — That the Laws now read be passed under their separate heads.

Moved by Mr. Keating, seconded by Mr. Dinneford, and

Resolved unanimously — That the Laws now read and passed be adopted as the Laws of "The Pharmaceutical Society of Great Britain."

Moved by Mr. Hulse, seconded by Mr. Yarde, and

Resolved unanimously — That the several Members of the Committee be the first Council of the Society, and do continue in office, exercising all the functions and duties provided by the Laws of the Institution, until the General Meeting in May, 1842; from which period the Council shall consist of twenty-one members only, to be elected according to the Laws.

Moved by Mr. Smith, seconded by Mr. Butler, and

Resolved unanimously—that Messrs. Hallows, Redwood, Yarde, F. J. Bell, and Edwards be appointed Auditors.

Moved by Mr. Hallows, seconded by Mr. Edwards, and

Resolved unanimously — That the thanks of this Meeting be given to the Metropolitan Committee, for their earnest and successful exertions in support of the privileges of Chemists and Druggists, and especially for having laid the foundation of a National Institution for the elevation and advancement of Pharmacy.

Moved by Mr. Thomas Herring, seconded by Mr. Wilkinson, and

Resolved unanimously — That the thanks of this Meeting be given to Richard Hotham Pigeon, Esq., for his efficient performance of the duties of Chairman.

R. A. FARMAR, G. W. SMITH, } Secretaries.

MEDICAL REFORM.

COULD we, for an instant, give credit to those who are exerting all their energies, and exciting such universal clamor for an alteration of the laws relating to medical practice, that they are actuated by motives directed solely to the advancement of medical science in its proper and legitimate form, or to the suppression of the disgraceful and disgusting knavery and chicanery which every where pervades its practical exercise, we should join them heart and hand in the laudable work of removing such a mass of moral corruption as at present exists, and should set about the task with a pleasure exceeding even that experienced by themselves in their efforts to enlarge the sources of gain by the usurpation of all the benefits of the profession to themselves.

That such beneficent and liberal motives

are far from the real causes of their operations, must be evident to every observer: in the first place, because classical education and scientific knowledge are not the sources from which their motives arise; and in the next place, because the men who compose the clique, are physicians and surgeons little known, and apothecaries for the most part passed by and degenerated; in fact, having little business of their own, they have ample leisure to twaddle in Exeter Hall, under the high sounding title of the British Medical Association—"vox et præterea nihil!!"

These men, we find, are not satisfied with braying at their various meetings, but are using other devices to mix up medical science with pot-house politics and electioneering blackguardism and falsehood. We have seen, among many other tricks, little labels of the size of an inch, having the following inscription:—"Whoever is a friend to mankind, should vote for medical reform." So, indeed, should we say, if it meant that every general practitioner, *i. e.* every apothecary, is to be compelled to receive a good classical education, and afterwards to acquire an equally competent knowledge of all branches of medical science, in which the examinations are neither partial nor extemporaneous, but minute and regulated. Such a course as this would have the two-fold advantage of warning the public against ignorance, and of conferring on this rank of the medical profession those qualities which belong exclusively to gentlemen.

We are glad indeed that the period of our publication accords with that of the general election, because it affords us the opportunity of meeting the medical *reform* gentry at this juncture, and we are in no fear of the result; for, that some great change will take place, is too evident to be mistaken by any but the wilfully blind or naturally stupid, and we are anxious to remind our readers that those members who are desirous of giving the lower rank of the profession an absolute power over the Chemist and Druggist, deserve no vote from them, but require narrowly to be watched during the ensuing contest. We trust that at the election, chemists will be duly impressed with, and act upon this suggestion in giving their votes and exerting their influence. Now is their time, and if they neglect it, they will next session perhaps have occasion to regret the oversight.

The ruin of the trade of the chemist and druggist, which is the legitimate object of the apothecary, will be the sure consequence of the measures sought to be made to pass into a law by the orators of Exeter Hall.

The perpetual vituperation of scribblers in *The Lancet*, about ignorant and prescribing druggists, is idle and ridiculous. What do these people think of the much more frequent errors of their order? In a recent visit to Bristol, we were made acquainted, upon unquestionable authority, of the death of a child, from sheer ignorance. What, indeed, are the host of men practising surgery without a diploma? Are these any more than prescribing chemists? Do they mean to contend that the bugbear of an examination at Apothecaries' Hall, is an adequate protection to the public, especially when into the account is taken the qualification of the EXAMINERS themselves?

We have been asked to define the office of an apothecary, but as yet we confess we are quite at a loss as to what is the peculiar province of his calling. However, from his dealing in commodities as well as aspiring to professional rank, and from those commodities being moreover of a very heterogeneous character, we should say that he is the "general dealer" in medicine, and no doubt it is the unpalatable idea that such is the case which renders him anxious to change his name by some legislative act which may give him the power of trading in fees instead of pills, pickles and toothbrushes: and should he even cease to trade in these articles, and receive payment "for work and labor done and performed," as the law terms it, unless he is far more enlightened in all respects than is now the case, he will pass only from the "general dealer" to "the pettifogging jobber" in medicine, and will be as frequently forcing his visits upon his luckless victims, as he now does his nostrums.

We hold in contempt all reflections cast upon the chemists by such men. Let any person read the account of one of them, and then let him judge if it is possible to find an equal among chemists. A medical man put a chimney-sweeper into prison * for two pounds two shillings and sixpence, although the apothecary owed him as much for sweeping his

* See the *Times* of Tuesday the 22d ult.

chimnies,—rather a long score for sweeping an apothecary's chimney!—(for apprentices inform us that great economy is practised in fire and candles),—yet to prison this man is sent, and there in a day or two he dies,* to the great *credit* of this practitioner's humanity and the *honor* of the profession! Can any one believe that a man with the education of a gentleman, and the acquirements of science, will thus disgrace himself and his brethren? The reply is—No. Such men are ignoramuses in the one, and mere smatterers in the other. We shall, indeed, be eager to get any measure calculated to reform such practices as this. Much better for the poor is it that chemists should do their best for them for a few pence paid at once, than that they should become liable to extravagant charges, and be compelled to discharge the debt by death in a prison!!

Chemists are now destined to become an educated and qualified body, and as such great good will result to the community, as the poor will be kept from debt, and from their worst alternative—dispensaries.

We hope that some provision will be made by the members of the PHARMACEUTICAL SOCIETY for the study and recreation of pupils and assistants. Many applications have lately been made to us on the subjects of "late hours" and "Sunday trading." No doubt these are detrimental to the improvement and comfort of the student, who, for study, health, and moral duties ought to have a fair allowance of leisure. We entertain no fear that these considerations will be duly appreciated by the trade generally, and that, ere long, some arrangement consistent with the mutual good of employers, assistants, and apprentices will be devised.

We cannot terminate these brief remarks without repeating our urgent desire that all diligence and caution will be employed to secure these rights hitherto so ably defended. Some active measures are indeed necessary, and these alone can save the trade from ruin and degradation. We trust, therefore, that the good fight will not cease until conquest is insured, and that those who are seeking to outstrip its members in tactics and devices, will be made to see that the "RACE is not always to the SWIFT, nor the BATTLE to the STRONG!"

* Why did not the "doctor" try to sell the sweep's body to pay the debt? We should be glad to see him change places with his late patient and prisoner, with the addition of the tread-mill.

MEDICAL REFORM AS AFFECTS DRUGGISTS.

LETTER IV.

To the Editors of The Chemist.

GENTLEMEN:—

WE have at length a real outline of a new and highly important national Institution for the advancement of science. Great credit is due to the exertions of the Chemists and Druggists, and most especially to the committee, for their labours thus far. The Chemists certainly have "achieved great things," as the worshipful grocers and barbers have also, in times past, had greatness "thrust upon them." Without any material pressure arising from medical opposition, arrogance, annoyance, or abuse, without remonstrance from the public, either, or shew of dissatisfaction with respect to their present condition, (albeit very much the reverse, as has been well testified by the public press,) the Chemists and Druggists have organized, by voluntary impulse, an Institution and system of education which, viewed as to the motive and manner of its formation, is perhaps without a precedent in the history of medicine.

That hybrid production—monstrous and anomalous—which has sprung from the ingrafting of medicine on the sugar tub, and chirurgical science on the barber's pole, styled in softer parlance the medical profession of England and Wales, has been rendered chiefly, if not entirely, what it is by the power of the legislature, urged on by the force of public opinion. Prior to any such interference on the part of the "collective wisdom of the nation," the ignorance of the medical profession was so gross, dark, and dangerous, as to be the horror and amazement of all historiographers who have written on the subject, and it is now perhaps the most exhaustless theme wherewith a medical journalist may fill up his columns. Dilating upon this same subject, a contemporary writer† says, "they, (the general practitioners) were a race of men who had received no regular education, either preliminary or professional; who had passed no examinations; whose entire complexion, as irregulars and quacks, was equally dis-

† *Medical Times*, vol. iv. p. 118.

graceful to the profession and the country; men, in fact, whom physic and surgery had robbed from gentlemen's service and regiments of infantry, as men-servants and privates of foot." "These," the same writer adds, "were lords and masters of some of the infirmaries, nearly all the dispensaries, and parish-doctors' appointments in the kingdom." That power and privilege, then, which was *forced* upon the inferior grades of the medical profession for the safety of the public, the Chemists and Druggists would be glad to accept the protection of themselves.

Might it now be irrelevant to ask how far the members of the profession have improved those powers, privileges, honours, &c., vested in them by act of parliament, for the benefit of the public? To what extent they have become more refined through the teaching of "ingenious arts;" and also whether they bear out that professional stamp, which the senate required they should be impressed with on receiving the benefits aforesaid?

In the first place, although it is the *boast* of the medical profession, that they are endowed with superior education and with high scientific acquirements, it is not in *that* profession that we need look for those generous and refined sentiments, that peculiarity of moral principle and action that marks sagacious talent or the polished mind.

> ...."Ingenuas didicisse *fideliter* artes
> *Emollit mores*, nec sinit esse feros."

But how many do we meet with who emulate the vilest quacks and nostrum-mongers in scandalizing the reputation of their brethren by the process of puffing up their own most senseless and worthless selves? Are not men to be found with diplomas to practise medicine, and thereby bound by the most solemn oaths not to countenance quackery, daily perpetrating perjury, not only in actually selling quack medicine, but also in advertising, puffing, and vending similar abominations of their own manufacture? Do they not in multitudes keep open shops and ape the man-milliner in ticketing up trashy merchandise for the purpose of catching flats and gapers? Is it not to yield the crab in place of the apple, when they dwindle to the old stock on which they were first graffed, by selling oils and perfumed grease for the peruke, soaps for "easy shaving," and the inimitable Macassar?

Without adverting in any uncharitable spirit to the various hidden and unknown instances in which human beings are untimely sent to the other world through ignorance, blunder, or neglect, do the profession observe that exterior courtesy and propriety, nay, oftentimes decency, of behaviour which alone can raise them above the multitudinous herd of petty traders, and command the reverence or confidence of the public? This, be it remembered, can never be accomplished by act of parliament—not even a "Medical Reform" Act. It is by the appearance that the world form their judgment; and when they observe that Druggists keep shops, and that Surgeons do likewise, the one perhaps clean and the other dirty, they simply enough identify the two, and even deduce from the extent of outward tidiness the degree of order that prevails within. How frightful is it to contemplate the dissolute and random slovenliness with which the weapons of life and death are often handled by medical pupils in the absence of their masters. "Throw a pint of *saline* into that bottle," was the expression of a beardless stripling one day to his fellow pupil, where I happened to be. The request was literally complied with, and the stuff *was* "thrown" in with a vengeance. It is no unusual sight to see pieces of pill mass thrown from one to another, and occasionally a regular volley of galenicals, which would bring on a general engagement. A beautiful confusion ensues!

From what has been remarked above, there will not appear on due reflection to be that occasion for arrogant boasting of itself on the part of the profession, still less for the vituperative disdain and contumely which is weekly attempted to be poured out by them upon the Chemists and Druggists. The latter have not possessed the advantages nor the legal privileges in their business which has been enjoyed by the former; but they are doing what they can to deserve the confidence of the public by *improving themselves* in scientific and other education. Would that the profession would "do likewise," and by reforming in themselves what they conceive to be amiss in others, not only spare the valuable time of the legislature, but enable the labourers at Exeter Hall to attend to their woe-begone practices and deserted homes.

I remain, Gentlemen,
Your obedient Servant,
W. G.

LATE HOURS AND SUNDAY TRADING.

To the Editors of the Chemist.

GENTLEMEN:—

THE subject of abridging the time allotted to business by Chemists and Druggists, in order to afford their apprentices an opportunity for study, has of late frequently been brought before you, and I think that, in consequence

of the excellent system of education now adopted by the Pharmaceutical Society of Great Britain, this subject demands the most serious attention of the masters, as it will become the duty of each, not only to give his apprentices every opportunity for study, but to see that they are actually qualifying themselves for the situation they are hereafter to occupy in society, by a close attention to those branches of scientific knowledge, which, it is intended, should be well understood by every dispenser of medicine. The various heads of examination, chemistry, medical botany, &c. &c. will require a vast deal of close study and practical experiment, which cannot possibly be applied to them, by an apprentice who is confined behind the counter, from six or seven in the morning to ten and frequently eleven o'clock at night, or even in the partial cessation from business, afforded by some masters, after eight o'clock in the evening, when the student is liable to continual interruption, until the shop is closed.

Some serious obstacles however exist, to closing the shops at eight o'clock, which has frequently been proposed; not the least of which is the general want of unity on the subject, among the masters; some would have no objection to it provided the others would agree; others think that nine o'clock would be quite soon enough, and on a late occasion, one gentleman, who has generally had the reputation of being a sensible man, actually objected to the scheme altogether, on the ground that the masters would not be sure where or how the young men would spend the time thus allowed them! — as though the culpable want of discipline, which thus appears to exist in his own establishment, were as prevalent in those of other chemists! In consequence therefore of the obstinacy of this individual, the whole scheme was compelled to be abandoned.

There are, however, other ways of accomplishing the object, than by closing the shops earlier: one that was proposed in *The Chemist* a month or two since, appears to me to be less liable to objections, than any I have yet seen; it was simply to allow each of the young men, in their turns, the whole of one evening for reading, while the others attend to the shop; this would allow sufficient time for necessary study, and at the same time, afford an opportunity (with the approbation of the masters,) for reading of a less important nature, as history, biography, and other subjects connected with general science and literature, not only as a necessary occasional relaxation from study, but for the general improvement of the mind. A Chemist and Druggist will be expected to know not only that which is immediately connected with his own profession, but to be well acquainted with many other branches of science and art; he ought to have a large stock, not merely of phrases and technicalities, but of general information, and he should be well able to converse on almost any subject.

A similar plan is also proposed with regard to the practical part of the course of study required. Chemistry cannot be studied properly, without experiments, and it is well known that very few experiments can be satisfactorily performed by candle or gas-light, which renders it almost impossible to judge correctly of the colour of a solution or precipitate, especially if of a blue, green, or yellowish hue, as, for instance, the precipitates formed in testing for arsenic with the nitrate or ammonio-nitrate of silver, or the ammonio-sulphate of copper; it is therefore proposed that each apprentice be allowed in turn two hours of daylight in the week, for experimenting, which would give him a better opportunity for verifying by actual observation the facts of which he has read, and for rendering himself familiar with the appearances and changes produced on bodies by chemical action.

There is also another subject on which I would wish to make a few observations; I allude to the importance of out-door exercise in the preservation of the health of shopkeepers, especially of the younger apprentices; this may be accomplished on the same principle by allowing two hours once or twice a week for one or two of the young men, to take a walk in the country, enforcing strict punctuality in this as in other relaxations from business, as the only means of avoiding abuses.

An advantage in these proposals is, that any chemist may try them, without having to obtain the consent and co-operation of his neighbours in the trade, or danger of injuring either his own business or that of any one else, and I am sure that no master who properly considers the importance of the subject, would grudge the time thus occupied, and that if generally adopted, it would tend greatly not only to the improvement and comfort of the young men, but to that elevation of the character of the Chemist and Druggist which is the object of the Pharmaceutical Society of Great Britain.

I remain, Gentlemen,
Your obedient Servant,
J. H. C.

Northampton, June 12, 1841.

LATE HOURS AND SUNDAY TRADING.

To the Editors of The Chemist.

Gentlemen:—

Seeing the deep interest you take in every thing which concerns the comfort as well as

advantage of the Chemist and Druggist, and particularly in the question of "late hours," &c., I am induced to trouble you with a description of an arrangement adopted by a retail house in a busy part of the metropolis, the prosperous and happy working of which seems to show very forcibly how much may be done to mitigate the evil of our oppressive confinement, by considerate management on the part of principals.

There are two assistants and one apprentice. At 7 o'clock the shop is open, and a quarter past 7 in winter. We breakfast at 8, and then each in turn has three-quarters of an hour to dress; at 2, dinner; at 5, tea; supper at 9; and shop closed by 11, though regular employment ceases at 8. At meals each takes a week in turn to remain in the shop while the others are absent, and every morning one is allowed to walk from 7 o'clock or earlier until breakfast, and after tea every day each in rotation is at liberty to read in a sort of counting-house, where "the Governor's" scientific library is kindly open to him, or occasionally, with permission, a walk is substituted, but never to be absent after 9 o'clock except by special agreement. On Sunday, no more is done than the public really require.

I am fortunate enough to belong to this establishment, and can well appreciate the advantages we enjoy over many others, having fagged for seven years to the full endurance of human nature;—for weeks together I have not been off my legs for half an hour during the entire 18 hours out of bed, meals included, and as we had no leisure, reading, far less study, could never be thought of. Fortunately in my school-days I obtained some knowledge of science, or else, after paying a large premium and serving a long apprenticeship, I should have been turned loose as an efficient member of an intellectual, or (might we not properly term it) *Professional Business*, as ignorant of more than its mechanical duties as the merest drudge.

A Retail Assistant.

May 24th, 1841.

To the Editors of The Chemist.

Gentlemen:—

Now that there appears to be an anxious and increasing desire amongst the greater number of Chemists and Druggists to put an end to the practice of "Sunday trading," allow me to suggest such a plan which, in my opinion, would go far towards the removal of this serious evil—at all events it would prove how far this trading is really necessary. It is simply this, that all medicines had on that day should be charged five or six times the usual price. This is a plan which I know, from experience, to be practicable on a small scale, and I feel convinced that its efficacy would be greatly increased by its general adoption. Leaving this at your disposal,

I am, Gentlemen,
Your obedient Servant,
J. S.

Brook-street, June 9th, 1841.

INFLUENCE OF SEDENTARY LIFE AND PROFESSIONS, AND STILL AIR SATURATED WITH MOISTURE, IN THE PRODUCTION OF CHRONIC DISEASES, AND ESPECIALLY TUBERCULAR PHTHISIS. HYGIENIC MEANS OF PREVENTING THE DEVELOPEMENT OF THESE AFFECTIONS.*

By M. Fourcault.

In this memoir are explained the results which I obtained, by means of observation and comparison of statistics, relative to the effects which are exerted on the physical constitution of man by two general causes, which appear to me to predominate over all others. By drawing from this double source, we obtain a proof that, on one part, sedentary life and habits, and on the other, still air saturated with moisture, produce a great number of chronic diseases, among which may be classed phthisis pulmonalis, scrofula, rachitis, and deformities of stature. Phthisis pulmonalis is seen to be increased in large cities, on account of the number of sedentary occupations: in an equally numerous population, its frequency is as evidently diminished among the inhabitants of rural districts, and among artisans who work in more or less spacious habitations, and who exercise their muscular power.

From statistical investigations whose results have been published, it appears that phthisis pulmonalis carries off one-fifth of the population of Paris, and one-fourth of that of London. This evidently is exaggerated. But even by reducing it to one-tenth for the former town, and to one-eighth or one-ninth for the latter, there still would be found a remarkable difference between this proportion and that which statistics give for less populous localities. Thus in cities of 2000 inhabitants and under, phthisis pulmonalis amounts to scarcely one-for-

* *Comptes Rendus de l'Académie des Sciences*, No. 22. May 31, 1841.

tieth or one-fiftieth of the total deaths, when those cities are in dry and elevated situations. In villages having this favourable position, this affection destroys only the sixtieth, the eightieth, and even the hundredth of the working population by which they are inhabited.

But when these cities and villages are situated in deep, strait, woody valleys, where the air is still, and at its maximum of dampness, phthisis and scrofula present their maximum of frequency. Their frequency diminishes towards the top of mountains, on the sandy platforms exposed to all winds. Valleys which are not very deep, where the air circulates freely, and where the moisture in the air is not considerable, produce only a small number of chronic affections; and, as in all places where atmospheric currents are powerfully felt, acute diseases predominate. However, some of the latter appear to me to be the result of the action of still and damp air on the skin; typhoid fevers, having an adynamic character, are frequent in Paris, London, and Rouën, in certain valleys, and on the damp banks of many rivers: they appear most frequently in autumn, that is to say, in the places and the season which tend to reduce transpiration to its minimum.

I confirmed the accuracy of the preceding observations in a journey which I made towards the end of the year 1840, into Belgium and England. In all places, sedentary habits and pursuits produce similar results. Lace-makers, spinners, knitters, sempstresses, and persons who are confined in workshops, die of tubercular phthisis in great numbers: this affection causes one-half of the deaths in the central houses of detention of Vilvorde and Ghent. By taking account of certain debilitating causes which operate in the state of seclusion, it is evident that man and animals die in great number from the tubercular affection, when they are confined, the former in prisons, and the latter in stables and menageries.

The influence of low and damp places developes in England and Belgium, as in France, a number of chronic diseases; the frequency of these diseases diminishes considerably towards the coast, where I have observed, especially in Belgium, the rarity of tubercular phthisis, scrofula, and schirrous and cancerous affections. It is to the influence of atmospheric currents that these happy results, and some of the physiological and therapeutical effects in persons sent to the sea-side must be attributed.

These facts show that the two general causes which I have noticed act deeply on the constitution of man, and determine a number of diseases attributed to other causes. I have induced diseases and death in animals, by suspending mechanically, by means of various stuccoes (*enduite*), the respiratory and secretory functions of the skin. Experiments, therefore, have confirmed the results of observation.

By pursuing this study, and relying at once, I repeat, on observation and experiment, light will necessarily be thrown on various questions of pathology and therapeutics. Already the facts which I have mentioned and the theory which shows their relations, explains the beneficial influence of muscular exercise, gymnastics, horsemanship, navigation, coursing, and dancing in young girls too long confined in-doors, and in subjects inclined to phthisis, scrofula, and deformity of stature; finally, these observations also show the plan that must be followed to prevent the development of a number of serious diseases, and to combat them.

OBSERVATIONS AND EXPERIMENTAL INVESTIGATIONS CONCERNING PLATINUM, CONSIDERED AS A PHYSIOLOGICAL AND THERAPEUTICAL AGENT.

BY DR. F. HÆFER.

The author first details the chemical properties of platinum and of the principal compounds of which it is the base.

In the second part of his memoir, he gives the results of experiments made on rabbits, on dogs, and on himself, with the view of ascertaining the physiological action of perchloride of platinum or chloro-platinic acid, chloro-platinate of sodium or double chloride of platinum and sodium, chloro-platinate of potassium, and chloro-platinate of ammonium.

Finally, in his third and last chapter, he details his investigations concerning the therapeutic action of platinum.

1st. The chlorides of platinum are poisonous: the perchloride in the dose of 1 gram., the chloro-platinate of sodium in the dose of 2 grammes.

2. The chloride of platinum are less poisonous than chloride of gold and corrosive sublimate.

3. The perchloride of platinum in concentrate solution produces on the skin violent itching, followed by a slight eruption in the part to which it is applied: taken internally, it at first irritates the mucous membrane of the stomach, occasions head-ache, re-acts on the nervous system, and thus exerts a peculiar alterative action on the fluids of the economy.

4. Chloro-platinate of sodium does not produce local irritation of the skin. Taken internally, it does not act on the nervous

system so much as the per-chloride of platinum; it more especially increases the urinary secretion.

5. Per-chloride of platinum is a very efficacious remedy in the treatment of syphilitic diseases, and particularly those which are of long standing, and which are inveterate and constitutional.

6. Chloro-platinate of sodium is more adapted for the treatment of recent syphilitic disorders; it is also very efficacious in the treatment of rheumatic affections.

7. Platinum must be classed among alterative medicines, with gold, iodine, and arsenic. It differs from mercury, inasmuch as it acts after previous excitation, and as its administration is not followed by any of the symptoms which are so objectionable in mercury. The salts of gold, which appear to be poisonous in much smaller doses than those of platinum, are efficacious, according to authors, only in certain cases of constitutional syphilis.

8. As an alterative medicine, platinum is preferable to either mercury or gold.

Dr. Hæfer employs platinum in the following forms and doses:—

DRAUGHT.

Per-chloride of platinum* .	10 centig.
Mucilage	180 gram.

F.S.L. A draught to be taken by teaspoonfuls in the 24 hours.

OINTMENT.

Lard	30 gram.
Per-chloride of platinum .	1 gram.
Extract of belladonna . .	2 grams.

For rubbing on indolent ulcers.

PILLS.

Per-chloride of platinum .	5 decig.
Extract of guiacum . . .	4 grams.
Powdered liquorice . . .	q.s.

F.S.L. 20 pills, to be administered in the dose of 1, 2, 3, and even 4, morning and evening.

DRAUGHT OF CHLORO-PLATINATE OF SODIUM.

Per-chloride of platinum .	3 decig.
Chloride of sodium, quite free from salts of potassa	5 decig.
Mucilage	200 gram.

To be taken in teaspoonfuls in the 24 hours.

INJECTION OF CHLORO-PLATINATE OF SODIUM.

Crystallised chloro-platinate of sodium†	2 grams.
Decoction of poppy-heads .	250 grams.

The conclusions to which Dr. Hæfer has been led by his investigations, appear to us important, and give us reason to hope that physicians will find in the preparation of platinum, a new and powerful means of combating syphilitic affections. We should remark, however, that these conclusions are founded on but a few experiments, and that they require caution before being definitively adopted. Dr. Hæfer is also of this opinion, and, therefore, he is continuing his investigations.

Annals of the London Homœopathic Dispensary, Ely Place, Holborn. Physician, Dr. Curie. Nos. I. to XI. London: T. Hurst, 5, St Paul's Churchyard.

Homœopathy explained, and Objections answered. London: T. Hurst, St. Paul's Churchyard, pp. 16.

In our brief notice of these two works it is not our intention to enter deeply into the merits of Homœopathy; we shall decidedly avoid doing so, recommending our readers to procure the works and examine the subject themselves.

The *Annals* will be found to contain facts worthy of notice as regards the homœopathic views concerning diseases and their treatment, and will amply repay both homœopathists and allopathists for the trouble of perusal: the one, by adding to his conviction of the soundness of his favourite doctrine; the other, by giving him opportunities of refuting what he believes to be erroneous

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* Bi-chloride or per-chloride of platinum is made by dissolving platinum in nitro-muriatic acid, and evaporating to dryness. The operation must be performed at a gentle heat, for otherwise the per-chloride is decomposed, and only proto-chloride, or even reduced platinum is obtained.

Bi-chloride of mercury in concentrated solution, or in the solid state, is of a very deep red; it is very deliquescent, very soluble in water, and soluble also in alcohol. It is formed of—

Platinum, 1 atom .	1233·2	58·22
Chlorine, 4 atoms .	885·2	41·78
	2118·4	100·00

† Chloro-platinate of sodium is soluble in water and alcohol; it crystallizes in beautiful transparent prisms of a deep yellow color. It contains—

1 at. of chloride of sodium	733·54	20·8
1 at. of bi-chloride of platinum . .	2118·40	60·0
12 at. of water . .	675·00	19·0
	3526·94	99·8

It is prepared by dissolving in water per-chloride of platinum, and very pure chloride of sodium, in suitable proportions, evaporating and crystallizing the solution.

dogmas. To each of these, therefore, we recommend the works before us.

In the *Annals* will be found numerous cases successfully treated on homœopathical principles. They also contain clinical lectures by Dr. Curie.

The second work, a small pamphlet, is of a less pretending nature: it is merely a familiar exposition of the science, replying to some of the common objections raised against it. With what success the author, who describes himself as "A Non-Medical Homœopath," has performed his task, we will leave to our readers to judge for themselves.

ON THE PREPARATION OF WHITE PRECIPITATE.*

BY M. REGNARD.

I do not think that there is any means given of obtaining from nitrate of mercury, by the solution of chloride of sodium, all the precipitate, one part of which passes to the state of soluble deuto-chloride.

I have found the following method quite successful:—

I evaporated, adding to it a fresh portion of mercury, a part of the liquid containing all the soluble deuto-chloride of mercury, which was thus brought to the state of protochloride and protonitrate; I then precipitated it, as before, by the solution of chloride of sodium, and I obtained a fresh quantity of white precipitate. Thus, by the solution of mercury in nitric acid, precipitation by the solution of chloride of sodium, the addition of a small quantity of mercury to the liquid, the solution of this mercury in the concentrated liquid, and by a new addition of a solution of chloride of sodium, there is a further precipitation of white precipitate.

OIL OF COLOCYNTH AS A SUBSTITUTE FOR CROTON OIL.†

BY DR. M. G. JUNELLI.

Dr. Junelli, in the *Memoriale della Medicina Contemporanea*, says that the oil of colocynth may be advantageously used as an external application in cases of rheumatism and neuralgy, and especially in sciatic neuralgy, as a substitute for croton oil. He says that this medicine being cheaper than croton oil, is within the reach of all patients.

* *Journal de Chimie Medicale*, March, 1841.
† Idem, ib.

BOUBEE'S GOUT SYRUP.‡

M. BOUCHARDAT'S FORMULA.

Extract of Guiacum ... }
Tincture of Sarsaparilla } āā 10 grammes.
Jalap Root ..... }

Add, with care, 100 grammes of alcohol at 21°.

Then pour in sugar syrup, 1000 grammes.

Mix carefully, and evaporate the alcohol at a gentle heat, continually stirring it.

This syrup is administered in the dose of a teaspoonful in a glass of water, and one, two, three and four teaspoonfuls until the purgative effect is produced.

M. Bouchardat thinks that physicians who have a natural repugnance to secret remedies, may prescribe the syrup whose formula is here given.

TO CORRESPONDENTS.

An Assistant.—The Laws and Regulations of the Pharmaceutical Society, published in our present No., will afford the required information. We agree with the suggestion of our correspondent, that the members of the Society would do well to engage as assistants none but such as are members of the Society.

A Chemical Student.—1,650 is right.

A New Subscriber.—Brande's Manual: that work will also give him the information respecting the battery.

An answer to J. T. M.'s question would involve too many suppositions and useless speculations, and occupy more space than the limits of our work will afford, and would then be quite unsatisfactory.

A. B. C.—The *Tinctura Lobeliæ Inflatæ* is made with ʒii of the dried herb and Oij proof spirit.

A Subscriber, Newcastle.—What information respecting iodide of arsenic does our correspondent require? If he will let us know by another letter he shall have an answer in our next.

Carstairs' Black Writing Ink.—We received a bottle of this ink from Mr. Burton. It certainly is of very excellent quality.

Nota Bene.—*All Communications and Books for Review must be addressed, "To the Editors of The Chemist, care of Mr. Hastings, Publisher, 13, Carey-street, Lincoln's Inn Fields, London." Communications must be pre-paid, and sent before the 15th of each month; Books for Review, before the 10th.*

‡ *Journal de Chimie Medicale*, May, 1841.

LONDON: PRINTED BY STEWART AND MURRAY, OLD BAILEY.

THE CHEMIST.

I. CHEMISTRY.

INVESTIGATIONS CONCERNING THE TRUE CONSTITUTION OF ATMOSPHERIC AIR.*

BY MM. DUMAS AND BOUSSINGAULT.

Besides carbonic acid, carburetted gases, and accidental vapours, the air contains oxygen and nitrogen in apparently uniform proportions.

It is generally admitted that the air is a mixture of oxygen and nitrogen, and its invariability is explained by supposing that plants decompose by their green parts, under the solar influence, all the carbonic acid developed by the respiration of animals or the putrefaction of organic matters. The uniformity of the composition of the air would therefore furnish the measure and proof of one of the most beautiful natural harmonies, and that which, connecting the two organized kingdoms to each other by the intermedium of the atmosphere, would thus place them in a state of mutual dependence.

However, all chemists are not convinced that the composition of the air is uniform, nor even that it is a mixture of oxygen and nitrogen.

With some of them,—Prout, Döbereiner, Faulkner, and Thomson, for example,—the uniformity of the elements of the air is so certain a fact, that they regard the air as a chemical compound, formed of 20 vol. oxygen and 80 vol. nitrogen. The confidence of the learned professor of Glasgow in this respect is so great, that he has derived from this the densities of oxygen and nitrogen, which have evidently served as a basis for a system of atomic chemistry.

With others, and here we must first mention the illustrious founder of the atomic theory, the venerable Dr. Dalton, the air is looked upon as a variable mixture of oxygen and nitrogen, containing a larger proportion of oxygen in the regions which we inhabit, and less in the higher regions. In this respect, Dr. Dalton's convictions are powerful and profound; they have all the character of mathematical convictions.

Indeed, this opinion is founded less on experiment than on calculation; and the latter, presented under a rather different form by M. Babinet, has led to analagous results. According to these views, the air of Paris being formed of 21 of oxygen and 79 of nitrogen in volume, we should have the following compositions at different heights:—

	Oxygen per 100 of air.
0	21
2000 metres	20·46
6000 ,, ...	19·42
10000 ,, ...	18·42

The calculations of Dr. Dalton and M. Babinet are now at variance with the results of experiments, and particularly with the results of analyses made by M. Gay Lussac on the air collected in his memorable aerostatic ascension, with those which one of us (M. Boussingault) performed in America at considerable heights, and finally with the analyses made by Professor Brunner, on the summit of Faulhorn, during a long stay which he made there for that purpose.

Thus, some chemists, according to their experiments, look upon the air as being formed of 20 oxygen and 80 nitrogen, and as constituting a true chemical compound. Others consider that it is an uniform mixture of 21 oxygen and 79 nitrogen. Finally, some are of opinion that its composition varies with the height.

All these opinions do not give a very high idea of the confidence inspired by the method habitually employed for analyzing the air; they prove that each thinks that he perceives in it sufficient causes of error to justify the few cases of known analyses with which he is acquainted.

The uncertainty increases when it is known, that the analysis of the air most perfectly agrees with the densities of oxygen and nitrogen, given by Berzelius and Dulong, which

* Read before the Academy of Sciences, Paris, June 7, 1841: *Comptes Rendus*, No. 23.

densities are evidently incorrect, as will be seen farther on.

Thus, it was not only on account of historical instruction to be bequeathed to posterity, that it was important to submit the composition of the air to a new and very accurate study, in order to inspire men of science with confidence. With respect to one of the last wishes that Laplace expressed on this subject, and which he entrusted to the execution of the Academy, a truly irresistible influence exists; for the most delicate theories of science seem to be met in this question, to clash with, and contradict one another.

Thus, according to Drs. Prout and Thomson, all gases have densities expressed by entire multiples of the density of hydrogen. Nitrogen is 14, and oxygen 16, times as heavy as hydrogen. Finally, nitrogen and oxygen are found in the composition of the air, in exactly the proportion of 1 to 4 in volumes.

As the same doubt prevails concerning these three points, it was necessary for us to make use of processes which were totally independent of the ciphers hitherto admitted for the density of oxygen and that of nitrogen; we were also obliged to avoid basing our analyses of the air on the composition attributed to any compound which we could produce with it, for we then should have been compelled to rely on former analytical data, and without throwing any doubt on any scientific facts, we thought it best to render ourselves independent of all circumstances foreign to the precise point which we wished to determine.

We found all these conditions combined in the employment of a very simple and easy process, and in which the only novelty is the means of substituting the measure of gases by their weight. Thus, we succeeded in analysing the air by weighing its oxygen and nitrogen.

Having exhausted a phial of its air, we connected it with a tube full of metallic copper, reduced by hydrogen, fitted with stop cocks, which allowed of a vacuum being formed in it. This tube was also accurately weighed.

The copper being heated to redness, one of the stop-cocks is opened to admit the air, which rushes into the tube, where it instantly yields its oxygen to the metal. In a few minutes, the second stop-cock, that joining the exhausted phial, is opened, and the nitrogen gas passes into the phial. The stop-cocks being left open, the air flows in, and as it does so, yields its oxygen to the copper; the gas in the phial, is, therefore, pure nitrogen. When it is full, or very nearly so, all the stop-cocks are turned. The phial and the tube full of nitrogen, are afterwards weighed; they are again weighed after being exhausted. The difference of these weights gives that of the nitrogen. The weight of the oxygen is furnished by the excess of weight which the tube that contains the copper acquires during the experiment.

We do not here insist on the precautions which we considered necessary in weighing the flask when full of nitrogen and when empty; they will be more in place in the discussion of the means which we adopted for ascertaining the densities of the oxygen and nitrogen. But we must state on what our conviction relative to the very basis of the process is founded: it is the total absorption of the oxygen of the air, which passes into the tube, by means of the copper. It is sufficient to see how the experiment acts, to be fully convinced on this subject. The air is suddenly deprived of oxygen, on its entry into the tube. The copper which is oxidised occupies a limited space; after the longest experiments, the oxidation is confined to the space of two or three centimetres. At the end of the experiment, therefore, the tube contains metallic copper possessed of all its lustre, and perfectly capable of detecting the last traces of oxygen.

Nevertheless, we did not content ourselves with these appearances. Everything being arranged in the ordinary way, we tripled the velocity of the current of air into the apparatus; and in this unfavourable condition we tried whether it would retain the oxygen: it did not keep a trace of it. We directed the nitrogen through a tube containing an ammoniacal solution of proto-chloride of copper, and we could not detect any appearance of coloration in that liquid. The slightest trace of oxygen would have turned it of a deep blue.

Executed by aid of this process on a large scale, all our experiments, without exception, tended to confirm the composition of the air admitted by the French chemists, and founded on the beautiful eudiometrical experiments by which, thirty-five years ago, Baron Humboldt and M. Gay Lussac fixed the composition of the air in an irreproachable manner, as well as their instruments would permit.

We will not describe all our analyses; we here give the detail of only those which were made when we had acquired experience in the management of the process. In proportion as we diminished the causes of error which had escaped us at first, the apparent differences in the composition of the air were effaced: it appeared to be more uniform, and we were necessarily led to attribute to errors of observation, differences which, at first, seemed to appertain to the constitution of the air itself.

The air which we submitted to analyses was obtained by glass tubes in the garden of the laboratory of one of us, (M. Dumas), near the *Jardin des Plantes*. When we made two simultaneous analyses, the two tubes terminated at the same point, and consequently took the air from the same place.

Six simultaneous experiments, two and two, therefore, give the following results:—

		PER CENT. OF AIR BY WEIGHT. Small phial.	Larger phial.
April 27.	Oxygen	22·92	22·92
28.	,,	23·03	23·09
29.	,,	23·03	23·04
	Mean.	22·993	23·016

And by taking the mean of the six experiments we find—

Oxygen	23·010 or 23
Nitrogen	76·990 or 77
	100·000 or 100

for the composition of the air in the circumstances under which we operated.

In an experiment in which we operated on air taken in the laboratory, we found only 22·5 of oxygen per cent. of air by weight. This difference, which is scarcely appreciable by the ordinary endiometrical methods, is expressed in our process by ciphers so considerable, that it could not escape the least attentive observation; but we reserve for another time the investigations relative to vitiated air which we intend to perform in a physiological and a hygienic point of view.

Thus, confining ourselves to the composition of normal air, we find that in the last days of April and in fine weather, it was formed of 2300 of oxygen, and 7700 of nitrogen by weight. This fact being independent of every correction and of every coefficient, may serve for discussing some ciphers of very great importance, namely, the densities of nitrogen and oxygen. Indeed by taking

2300 oxygen,
7700 nitrogen,

10000 air,

and dividing each of these numbers by the respective densities of oxygen, nitrogen, and air, we must find a suitable correspondence in the volumes deduced from them. And as the density of the air is unity, 10000 of air by weight represent 10000 in volume, which should form the sum of the volumes of 2300 oxygen, and 7700 nitrogen. We should therefore have

$$\frac{2300}{1{\cdot}1026} + \frac{7700}{0{\cdot}976} = 10000,$$

if the densities of oxygen and nitrogen given by Berzelius were correct. But, on the contrary, we have

	By weight.		In volume.
1st,	10000 air	=	10000 air
2d,	7700 nitrogen	=	7889 nitrogen
	2300 oxygen	=	2086 oxygen
			9975 air in vol.

The volume of air, which ought to be equal to 10000, would therefore amount to only 9975, corresponding to an error of $\frac{25}{10000}$. As we thought that such an error was not possible in our experiments, we thought it necessary again to take the densities of the oxygen and nitrogen, with redoubled care.

The principle on which we had relied gradually led us into many obscurities; but we hope that there will result from it a method capable of introducing into this kind of investigations a precision with no other limits than those that result from the capacity of the vessels.

The density of a gas may be appreciated by comparing the weight of air which a phial loses when exhausted *in vacuo*, and that of the gas which is passed into it. This method is very convenient; it is most frequently employed, but it supposes that the gas is previously collected in a reservoir from which the phial is filled. Now, we wished to avoid preparing our gases beforehand, and preserving them in receivers, a practice attended with many difficulties, relative to the purity of the gas, on account of the changes of gas and air, which are effected by contact with the liquid saturated with air, which is confined to certain limits difficult to exceed.

The following is the process which we followed:—The gas was prepared so as to come pure and dry to the extremity of a tube put in communication with an exhausted phial. On opening the stop-cock of this vessel, the gas rushes into it. Its production and introduction into the phial are so regulated that there is always in the apparatus which serves to produce and purify it, a more than ordinary pressure.

When the phial is full of gas, it is exhausted and filled again. It is then supposed to be full of pure gas.

The weighing must then be proceeded with as follows:—1st, the weighing of the phial full of gas; 2nd, that of the exhausted phial; 3d, that of the phial full of dry air. They may be proceeded with in the order indicated, and they furnish the weight of the gas, and that of an equal volume of air.*

It remains to ascertain the proper temperature of the gas and that of the air in which the phial was weighed. It is in this, without doubt, that consists the secret of the differences observed in the numbers expressing the densities of the gases given by so many illustrious philosophers and chemists, and so different from one another, that no one ever dared to take their mean.

In order to have certain uniform and easily appreciated temperatures, we were obliged to place in the phial M. Danger's thermometer, which indicates the hundredth of a degree. The stem of this thermometer is fixed in a glass tube interposed between the socket of the phial and its stop-cock. The observer may then read off the exact temperature of the gas,

* This principle has already been turned to account in the investigations relative to the density of carbonic acid gas, by MM. Dumas and Stass. (See *The Chemist*, No. XV. p. 65.)

without moving the phial from its circle, where it is in a state of equilibrium of temperature.

This circle or artificial cave is formed by means of a large cylindrical zinc vessel, surrounded by a larger one, with a space of two centimetres between them. The annular space left between them, the space between the internal and the external vessel, is filled with water. The opening of the cave is covered with a moveable lid, in the thickness of which is a layer of water two decimetres thick.

The phial lodged in this circle is consequently surrounded by two decimetres of water, whose temperature is known to the $\frac{1}{100}$ of a degree. The phial being likewise furnished with a thermometer which indicates its internal temperature with the same precision, it is sufficient to wait until the two thermometers correspond, to be certain that the gas possesses the same temperature throughout, to nearly $\frac{1}{100}$ of a degree.

There is no occasion to push the accuracy further in this respect, because in the largest of our phials an error of $\frac{1}{100}$ corresponds only with an error in the weight of $\frac{7}{10}$ of a milligramme—a weight which a balance charged with one or two kilogrammes does not appreciate.

When the stop-cock of the phial is shut, the pressure of the gas is known to the twentieth of a millimetre, since it is equal to that of the external air, expressed by the barometer, and its temperature is known to the $\frac{1}{100}$ of a degree.

To ascertain the exact weight of the phial, precautions of the same order are necessary.

Indeed, when the phial is suspended to the balance, and when the observer approaches to weigh it, he heats the phial and the air surrounding it: currents are established; the apparent weight of the phial varies to such an extent as to preclude all idea of absolute accuracy.

We made use of a balance on Fortin's system, very carefully constructed by M. Deleuil, balance-maker to the French Mint. This balance was placed in a double leaden sideboard, with a layer of quicklime inside, to maintain the air in a constant hygrometric state. The phial, suspended by the balance, floats in this sideboard, and the doors of the latter being shut, it is sheltered from all external radiations. A thermometer, giving the hundredths of a degree, placed by the phial, immediately gives the temperature of the air of the sideboard; a barometer gives the pressure.

In general, we cannot obtain the weight of a phial twice alike; and in general, the air of the sideboard undergoes variations of a few hundredths of a degree, and correction being made, the weights coincide. If the observer could not take account of the temperature of the air with the extreme precision that we have done, he would be led to take a mean between the apparently discordant weights, and his mean would be inaccurate; while in reality the weights were very accurate, and required only a correction of temperature, to perfectly agree with one another.

By means of these processes, we first took the weight of oxygen a great number of times, which showed us most evidently that the density, 1·1026, given by MM. Berzelius and Dulong, could not be retained, and was farther than any from the truth, as, however, M. Dulong feared.

The experiments which we performed on the latter, and in which we adopted every measure calculated to ensure complete success, were made with oxygen prepared with a mixture of concentrated sulphuric acid and peroxide of manganese. The gas was purified by passing through tubes or flasks containing *liquor potassæ*, and it was dried by being driven through tubes or flasks containing pure concentrate sulphuric acid.

DENSITY OF OXYGEN.

1st experiment	. . . .	1·1055
2d do	. . . . .	1·1058
3d do.	. . . .	1·1057
		3·3170
Mean	. . . .	1·1057

This exactly corresponds with the density adopted by M. T. de Saussure—1·1056. It nearly coincides also with the old density of MM. Biot and Arago—1·1036; and the deficiency of the latter is no doubt owing to the oxygen, so carefully prepared by M. Thenard for the experiments of MM. Biot and Arago, having acquired a small quantity of atmospheric air, in passing through the water used to electriate it.

The correction which we have just made in the density of oxygen, far from establishing a correspondence between the composition of the air which we determined by accurate experiments, and the densities of oxygen and nitrogen, increases the difference between them, which we have shown above. Indeed, we should have—

$$\frac{2{\cdot}300}{1{\cdot}1057} = 20{\cdot}80 \text{ vol. oxygen.}$$

$$\frac{7{\cdot}700}{0{\cdot}976} = 78{\cdot}89 \text{ vol. nitrogen.}$$

99·69 vol. air, instead of 100·00.

That is to say, that with our composition of the air, our density of oxygen and the density of nitrogen of MM. Berzelius and Dulong, the density of the air cannot be represented. The error is very great; for in an element of this importance, an error amounting to nearly half per cent. is enormous.

This is owing to MM. Berzelius and Dulong's having admitted a composition of the air nearly like ours, being led to compensate for the too low density of oxygen which they found, by too high a density for nitrogen.

We took the density of nitrogen by means

of the nitrogen procured from the air by copper, absorbing the carbonic acid and water, with potassa and sulphuric acid. The following are the results of three experiments:—

DENSITY OF NITROGEN.

1st experiment	0·970
2d do.	0·972
3d do.	0·974
	2·916
Mean	972

By adopting this density, that of oxygen, and the proportion in weight by which we have represented the composition of the air, we find the following numbers:—

$$\frac{2{\cdot}300}{1{\cdot}1057} = 20{\cdot}80 \text{ vol. oxygen,}$$

$$\frac{7{\cdot}700}{972} = 79{\cdot}22 \text{ vol. nitrogen,}$$

100·02 vol air,

which represents to nearly $\frac{1}{10000}$, the density of the air taken as unity. By taking the numbers as given by experiments—

$$\frac{2{\cdot}301}{1{\cdot}1057} = 20{\cdot}81 \text{ vol. oxygen,}$$

$$\frac{7{\cdot}699}{{\cdot}972} = 79{\cdot}19 \text{ vol. nitrogen,}$$

100·00 vol. air,

we should have a similarity.

However, we will admit, as sufficiently accurate, the expression of the composition of the air, which consists in considering it as formed of 20·8 vol. oxygen and 79·2 vol. nitrogen.

This expression is evidently very much at variance with the commonly received opinion; still, very serious corrections were required to be made in the densities of the nitrogen and oxygen, in order to ascertain the ponderal composition of the air.

By considering for a moment, as normal air, that which we collected towards the end of April, in fine dry weather, in the neighbourhood of the *Jardin des Plantes*, we might now, therefore, regard its composition as perfectly established to less than $\frac{1}{1000}$ in volume or weight at will.

But this composition should vary. When it rains, the water which condenses dissolves and carries away more oxygen than nitrogen; when it freezes, the water abandons these gases; evaporating water also returns them to the atmosphere. Combustions, the respiration of animals, remove oxygen from the air; plants, by their green parts, return it to it every day, under the solar influence. These causes, and many others without doubt, tend to disturb the equilibrium of the elements of the atmosphere in a given point, some in one direction, some in another. It therefore remained to be ascertained whether the tendency which gases have to mix, aided by the vertical currents which the difference of temperature excites, favoured by the winds which incessantly transport and confound the horizontal layers of air, would not rapidly cause the disappearance of the momentaneous differences resulting from the local action of the causes which we have just briefly mentioned.

Experiments made with this view, to be positive, would require time that we could not devote to it, and apparatus which we do not yet possess. In making our trials, we therefore especially kept in view to seek the limit, below which it would be useless to undertake such.

All the experiments above detailed, having been made in fine and dry weather, we repeated them on a wet day; the oxygen being carried away in solution by the water, in a larger proportion than the nitrogen, this circumstance promised more appreciable differences than any we could imagine. Unfortunately, we could realize our expectation only with a little variation from our first analyses. The following are our results:—

Weight of the oxygen		5g. 648	23·015
Weight of the nitrogen	of the tube . . 0.052	18·892	76·985
	of the phial . . 18.840		
Air analysed		24·540	100·000

Thus, while the mean of our six experiments made in fine weather, gave 23·010 of oxygen per 100·000 of air, we found in rainy weather, 23·015, or exactly the same proportion. It might be supposed, indeed, that the difference of the season compensated for that produced by the rain; but these variations are too slight to be put in evidence, except by a numerous series of experiments, carefully executed in a laboratory devoted to meteorological studies. It was demonstrated to us that the oxygen does not vary $\frac{1}{1000}$ under the influence of rain; a result which may be explained, if it be wished, by saying, that before coming within four metres of the earth—the height at which we took the air for analysis—the rainwater was already saturated with air in the higher regions of the atmosphere which it had passed through. But in this case the analysis could teach us nothing, except by throwing to a considerable height a phial destined to bring into the layer of air, whence the rain is precipitated, the tube which yields to the apparatus the air intended for analysis.

Does the quantity of oxygen vary with the height? Nothing shows this to be the case, and we are warranted by positive experiments in believing the contrary.

The air brought by M. Gay Lussac, from a height of above 7000 metres, was analysed by

him and M. Thenard. It was not then known, as it is now, with what facility hydrogen is impregnated with air, on the contact of water. The analysis indicated a little too much oxygen, 21·6, every correction made. But as the precaution was taken, of analysing at the same time, in the same manner, and with the same hydrogen, air taken in the court of the *Palais Bourbon*, it was shown, by the identity of the results, that air taken at the surface of the earth, and air taken at an altitude of 7000 metres, had the same composition.

The numerous experiments executed in America, by one of us (M. Boussingault, see *The Chemist*, No. XVII., page 129,) are represented in mean by the following numbers:—

	Metres.	Oxygen per cent. in volumes.
At Santa Fé de Bogota at	2650	20·65
At Ibaqué ..... at	1323	20·70
At Mariquita ..... at	548	20·77
Mean		20·70

	Metres.	Oxygen per cent. in volumes.		
Mountain of Helvellyn.....	900	20·70	Manchester	20·88
Id......		20·58	*Id.*	21·10
On Snowdon.....	1050	20·65	*Id.*	20·80
Air taken in a phial at	2880	20·52	*Id.*	20·92
Id., taken at	4500	20·59	*Id.*	20·95
Air taken at the sea of ice valley of Chamounix		20·20		
Air of Simplon		19·98		
Wengern Alp		20·45		
Id......		20·11		

By studying these numbers, it is seen that among Dr. Dalton's analyses, those which he made on recently obtained air are found comprised within the limits of the possible errors of the hydrogen eudiometer; those which were executed with air brought from the Alps, on the contrary, are very far from it. Must these differences be attributed to an accidental alteration of the air, or to an actual modification in the composition of the atmosphere of the two places? It is this that we very much desired to set at rest.

For this purpose, it was necessary to compare the air analysed near the surface of the earth, and by means analogous to ours, with that which we had ourselves analysed. We therefore profited by the excellent observations of Professor Brunner, of Berne, on this subject. This skilful chemist went to spend a few weeks at the top of the Faulhorn, one of the mountains of Bernese Oberland, in a house situated at a height of 1950 metres, and there he devoted himself to the analysis of the air. As the Faulhorn and the Wengern Alp form part of the same chain of mountains, Brunner's experiments may serve as a means of comparison with the analyses made by Dalton of air taken in the latter locality.

At first sight, Professor Brunner's analyses and ours appeared incomparable. Indeed, he removed the oxygen by means of phosphorus, and he appreciated this oxygen by the weight. But as in each of his experiments the weight of the oxygen scarcely exceeded 120 or 130 milligrammes, the error which he might commit must amount to at least $\frac{1}{100}$, and even to $\frac{1}{10}$.

As for the nitrogen, Professor B. measured it, and deduced its weight from its density.

Thus practised, evidently on too small a scale, this method would indicate variations in the oxygen from 20·8 to 21·1 in volumes per cent. of air. But, this difference can be owing only to errors of weight, for it does not exceed $\frac{1}{70}$, and is nearly within the presumable errors of experiment itself. Besides, the extreme numbers are identical with those which eudiometrial analysis gives at Berne or at Paris.

But as it was difficult to avail ourselves of Brunner's experiments, they therefore became more valuable when we considered them as a whole. Indeed, by combining them to make an unique experiment, the errors of weight ought to be compensated; and if, as we think, the composition of the air varies little from one day to another, it scarcely matters whether this experiment lasted a fortnight, or whether it was made at once.

Professor Brunner, in his fourteen experiments, collected 4502 cubic centimetres of nitrogen at 0° and 0′ 76, i. e. in weight 5 gr.

These results evidently agree with those which we have just found for the composition of the air taken at Paris: they indicate at least that the differences, if there be any, are not of the order of those indicated by the theory, the calculations, and even the experiments of Dalton.

Dr. Dalton published a series of various and numerous experiments, from which it would appear that the proportion of the oxygen to the nitrogen is not the same in all localities at the surface of the earth; that it varies with the seasons and the height. His analyses would show that in proportion as we ascend in the atmosphere, the oxygen very considerably diminishes, although not so much as his theory indicates. The following are the principal results to which he attained:—

7649. The sum of the fourteen determinations of oxygen gave 1 gr. 723 for the total weight of that gas.

Thus, at the top of the Faulhorn, *during the month of July*, 1833, the air contained the following elements :—

Oxygen ..	1·7230	23·010
Nitrogen ..	5·7649	76·990
	7·4879	100·000

whilst we found 23·010 as the mean of our analyses; Professor Brunner therefore found 23·010 as the mean of his. Take, however, 23·010, or rather 23·015, which would result from our best analyses, it is clear that differences of this nature are owing to errors of observation, or are confounded with them.

It is not very probable that during the time occupied by Brunner's experiments, there was any variation in the air of the Faulhorn, although his partial experiments indicate slight ones, which we attribute to errors of weight. It is therefore demonstrated that the composition of the air at the top of this mountain, was precisely the same as that which we find in Paris at the present time, our assertion being bounded by the limits that observation can attain to, namely to nearly $\frac{1}{1000}$; for we do not wish to go farther, although it may be done.

M. Brunner's process has lately received an application in a very interesting locality, on account of the distance which separates it from Paris and Berne; that is, Groningen. The author, M. B. Verver, has accidentally omitted to mention the year in which he made the experiments, but we have every reason to believe that they were made in 1839; they were executed, moreover, in the months of May and August.

They lead to precisely the same consequence; for, according to M. Verver's experiments, the air of Groningen contained, in weight, 22·998 of oxygen or 23, as we found in Paris, and M. Brunner on the summit of the Faulhorn.

Thus, without pretending that Dr. Dalton's opinions concerning the constitution of the atmosphere are ill founded; it is shown that by the effect of the diffusion of the gases, by the various causes of agitation which incessantly tend to mix the layers of air, the difference which might otherwise exist at various heights, becomes inappreciable.

If the composition does not vary with the altitude, if no appreciable difference can be discovered when it is analysed at points situated at some distance from each other, is it the same when the proportion of the gases which constitute it are compared at different times?

This very interesting question has already excited the attention of MM. Laplace and Thenard. These illustrious men of science desired that an analysis of air, executed at certain periods in an official manner, should allow the true constitution of the atmosphere to be fixed for a given period, and that its modifications, if it presented any, should be noted.

If the academy has not hitherto fulfilled this desire, it is because the analytical processes were totally inefficient for this purpose. We shall soon show that if the process which we have just employed was not suitably modified, it would not present any chance of discovering the variation which the composition of the air is susceptible of, through causes which actually act on the surface of the globe, and whose effect cannot reach the limits in which the old analyses of the air are confined, or even those which we have just performed.

It is not, therefore, in the old analyses of the air that we can find terms of comparison fit for verifying the doubts relative to the permanence of the constitution of the atmosphere.

But it appeared to us that the weight of a litre of air, so carefully taken by MM. Biot and Arago, offered an excellent term of comparison. If this weight is not the same now as then, it is doubtless the composition of the air that is changed; but if this weight has not varied, it must be concluded that this weight is the same as it was forty years ago. As the weight of the litre of air was determined to about $\frac{1}{1000}$, the precision of which this comparison admits, exceeds that which can be obtained by any other process.

We have endeavoured to render this comparison as certain as possible, by taking a phial nearly of the same capacity as that used by MM. Biot and Arago; by weighing at the same temperature as they did; finally, by weighing the phial in the air, without a thermometer inside, that is to say, absolutely the same as was done before we applied to these kinds of experiments the precautions which we have described.

Four experiments, made in this way by one of us, in conjunction with M. Stass, last year, would give 1·2995 for the weight of the litre of air, while MM. Biot and Arago found 1·2991.

These numbers are similar; but to obtain the weight of the air more accurately, it evidently was necessary to introduce into this mode of weighing the precautions of which we availed ourselves in taking the density of oxygen and nitrogen. We are now engaged with it. In the meantime, we may deduce :—1st, from this comparison of the weight of the litre of dry air at 0° and 0m 76;—2d, from the justly celebrated analysis of MM. Gay Lussac and Humboldt, compared with ours,—that the composition of the air has not varied to an appreciable extent for forty years. This conclusion will not surprise meteorologists, whom long custom has taught to look on atmospherical phenomena as less easy to be modified by accidental causes than is commonly admitted.

It is therefore demonstrated that the proportion of oxygen to nitrogen in the air, is not expressed by simple numbers in volume; that this proportion is invariable to $\frac{1}{1000}$ in distant latitudes, at distant periods, and at different heights.

The phenomena of organic life, the spontaneous decompositions of animals and plants, the combustions or oxidations which are accomplished on the surface of the earth—all these events, which our imagination is pleased to enlarge upon, are, happily, without doubt, those facts which pass, as it were, unnoticed as regards the general composition of the air which surrounds us. To reach the limit at which may be perceived the variations which the atmosphere might undergo, from the animals or plants, from the seasons, rains, and winds; to decide whether its composition remains invariable in various latitudes and at various heights, it is not necessary, therefore, to perform the analysis of the air to $\frac{1}{20}$, as formerly, nor even to $\frac{1}{1000}$, as we have done; it is necessary to go farther; as if, by a providential foresight, nature had intended that the possible alterations of the atmosphere by the regular play of the forces which act at the surface of the earth should never approach, even at a distance, to the limit at which animal or vegetable life might suffer from it.

Some calculations, which, doubtless, are not absolutely accurate, but which, nevertheless, are based on sufficiently certain data, show to what extent it is possible to push the approximation so as to reach the limit where the variation of oxygen could be evidently manifested.

The atmosphere is incessantly agitated; the currents excited by heat, by the winds, by electrical phenomena, perpetually mix and confound its various layers. Therefore the general mass should be altered in order for analyses to indicate variations between one period and another.

Let us suppose, with B. Prevost, that every man consumes a kilogramme of oxygen per diem, there are one thousand millions of human beings on the surface of the earth, and that by the effect of the respiration of animals or by the putrefaction of organic matters, this consumption attributed to man be quadrupled.

Suppose, moreover, that the oxygen disengaged by plants compensates only for the effect of the causes of absorption, forgotten in our estimate: this will put very high, certainly, the chances of alteration of the air.

Indeed, by this exaggerated hypothesis, at the expiration of a century, all the human race combined, and three times as much, would have only absorbed a quantity of oxygen equal to 15 or 16 cubes of copper of one kilometre the side, while the air contains nearly 134,000.

Thus to pretend, that by using all their efforts, the animals which inhabit this globe could in a century deteriorate the air which they respire, to the extent of one eight-thousandth part of the oxygen which nature has furnished to it, is to make a supposition infinitely higher than reality.

The respiration of animals produces carbonic acid; plants destroy it, seizing the carbon, and restoring the oxygen to the air. The modifications which the air undergoes with respect to its oxygen will, therefore, be almost of the same order as those which are observed with respect to its carbonic acid.

Now it is easy accurately to estimate the weight of the carbonic acid contained in the air, by means of M. Thenard's method, which consists in weighing in the state of carbonate, the carbonic acid yielded by a large volume of air carefully measured. This method, modified in its details by MM. de Saussure and Brunner, indicates that the carbonic acid of the atmosphere varies in volume from $\frac{4 \text{ to } 6}{10{,}000}$. Supposing that this carbonic acid comes from the oxygen yielded by the air, and not from that incessantly emitted by volumes, the difference of these numbers, which is equal to $\frac{1}{10000}$ of the volume of the air, would express the variation which the oxygen should have undergone.

Thus, in 10,000 volumes of air would be found 2081 or else 2083 of oxygen.

This difference would evidently be inappreciable, if we limited ourselves to analysing 10 or even 25 grammes of air, as we have done, since it would be represented by one or two milligrammes. In operating on 100 grammes of air, the difference would be equal to 20 or 30 milligrammes. In analysing 1000 grammes, it would amount to 200 or 300.

It is necessary to arrive at that, if it be wished that the analysis of the air should really become of some utility in the discussion of the general laws of terrestrial physics.

But as we have no means of weighing one cubic metre of nitrogen, it evidently is necessary to change the process which we have just described for one analogous to M. Brunner's, by which the nitrogen is measured, and only the oxygen weighed.

An apparatus of one cubic metre, full of water, must be placed in a cellar, and the nitrogen of the air which has lost its oxygen, by passing through a series of tubes filled with copper and heated to redness, must be passed into it. Three tubes, each containing one kilogramme of copper, would be sufficient for one cubic metre of nitrogen. By weighing these three tubes, they will make known the oxygen of the air with an accuracy worthy of the present state of science; for we shall have fixed 376,000 milligrammes of oxygen: and in executing ten experiments, we shall be able to determine the oxygen to nearly $\frac{1}{10000}$ with certainty.

The delicate point of these experiments con-

sists in measuring the nitrogen at an exact temperature.

To say that we desire that this experiment should be made at Paris, under the auspices of the Academy, would be merely to repeat the wish long since expressed by Laplace and Thenard—a wish in which all the friends of science concur.

But we may now go farther: France is enriched with new centres of scientific activity; faculties full of life and ardour are disseminated over the surface of its soil. The Council of Public Instruction would, we have no doubt, enter into the views of the Academy, and ordain, in concert with it, a simultaneous experiment which would allow of the analysis on the same day, by operating on about 1½ kilogrammes of the air at Bordeaux, Strasburg, Rennes, Lyons, Toulouse, Montpellier, &c.

Moreover, without quitting the circle of our personal friends, and without the Academy's assistance, we are certain that as soon as an experiment of this kind could be established in Paris, and as soon as all the minor arrangements of the apparatus could be determined, we could obtain the concurrence of chemists and philosophers, who would execute at Geneva, Naples, London, Dublin, Brussels, Stockholm, Copenhagen, &c., experiments simultaneous with those made at Paris.

It is for the Academy to decide whether these investigations are worthy of the interest with which they have inspired some of its most illustrious members, and whether, combined with the experiment in which M. Arago is engaged with his double tube, they do not hold out a promise of data concerning the composition of the air sufficiently important to justify our desire of seeing them soon executed under its patronage.

For our part, our task is fulfilled; what we could do with our individual means, we have accomplished.

Our investigations correct errors in the density of oxygen and that of nitrogen, and fix the former at 1·1057, and the latter at 0·972.

They shew that the air can by no means be considered as a chemical compound formed of 20 volumes of oxygen and 80 of nitrogen.

They make it to be presumed that the air is an uniform mixture at every time, in every latitude, and at every height, of 2301 of oxygen in weight, and 7699 of nitrogen; or indeed 20·81 of oxygen, in volume, and 79·19 of nitrogen.

They shew that if atmospheric air constitutes a reservoir of oxygen for the use of animals, and a reservoir of carbonic acid for the use of plants, this magazine is so considerable, and so richly endowed with regard to consumption, that the latter, supposing that it was not compensated, would remain almost insensible in the mass, even after a long series of years:

Whence it follows that there is no chance of appreciating real differences by the analysis of the air, as to the proportion of oxygen and nitrogen, if we do not make suitable arrangements for executing this analysis on about 1½ kilogramme of air.

All the experiments detailed in this Memoir, were executed with the zealous and conscientious concurrence of two young chemists, to whom we are indebted for their assistance, M. Leblanc, formerly pupil of the Paris School of Mines, and M. Lévy, a Danish chemist, who are going to execute, at Copenhagen, observations corresponding to those of Paris.

After the reading of the Memoir of MM. Dumas and Boussingault, on the motion of M. Arago, the academy decided that a commission should be appointed to discuss measures to be adopted for the realization of the new work indicated in this memoir, that is to say, analyses of the air made simultaneously in various French and other towns, with all the precautions considered necessary for ensuring perfect accuracy in the results. This commission will be composed of MM. de Humboldt, Thenard, Biot, Gay Lussac, Arago, Dumas, Boussingault, and Regnault.

ON THE ATOMIC WEIGHT OF IRON.

BY M. CAPITAINE.

If a piece of zinc be plunged into a solution of proto-chloride of iron, as neutral as possible, in a short time the zinc becomes powerfully magnetic; and if the immersion be continued long enough, a pappy mass is formed, which is iron. At the same time, bubbles of hydrogen are disengaged. By this process, it seems impossible to obtain iron free from zinc.

To obtain it, it is necessary to solder to the zinc, a sheet of well cleaned copper, which must descend into the ferruginous liquid. This sheet is gradually covered with a lamellar layer of iron, which may easily be detached by bending the copper in different directions. The iron is of a bluish white, and possesses metallic lustre, especially on the side next the copper; it is extremely friable. In order to dry it without altering it, I submitted it to a current of pure and dry hydrogen, at a dull red heat; after this operation, the metallic plates acquired a very great tenacity. Regarding the iron as perfectly pure, I wished to use it for verifying the atomic weight of iron given by the most recent authors. I adopted two processes:

1st. Proxidation by means of nitric acid, and the comparison between the weight of the

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metal employed, and that of the peroxide obtained.

2nd. The solution by means of dilute sulphuric acid in a graduated tube over mercury, and by measuring the hydrogen disengaged. (It is difficult thus to dissolve all the metal.)

These two operations, and especially the first, which appeared to me capable of great accuracy, have always given a mean atomic weight of less than 339, and which, deduced from the best operations is not far from 321. The atomic weight of zinc being greater than that of iron, we cannot attribute to its presence the difference which exists between the cypher which I obtained and that given in the most recent works.

Iron thus obtained, acts with reagents in the same manner as ordinary iron; I should observe, however, that its peroxide appeared to me rather more fusible.

I have communicated to the academy only the first part of this work, because I had observed in the reduction of the peroxide, certain peculiarities for which I have not had time to account. Such is the formation in the tube of a small quantity of a white volatile sublimate, which occurs only when the temperature is very high. The hydrogen was purified by passing through a very large flask filled with potassa and chloride of calcium.

REVIEWS.

Lectures on Chemistry, including its Applications in the Arts. By HENRY M. NOAD, Lecturer on Chemistry, &c. No. I.—London: SCOTT, WEBSTER, and GEARY, Charter-House-square; HASTINGS, Carey-street.

MR. NOAD, Author of "Lectures on Electricity," is now engaged in publishing, in parts, a Course of Lectures on Chemistry, a most excellent work.

The first of these lectures, being exclusively devoted to a history of chemistry, and of its most distinguished professors, from the dark and unenlightened days of alchemy to the present time, when discoveries have illumined that which before was obscure, does not enter into any details concerning the science to be treated of in future numbers. From the able and succinct way in which the author has handled his subject in the present number, we augur well for the future; and we recommend it to such of our readers as are beginners in chemistry, as being most eminently adapted for them.

To select a passage for insertion here, is a task attended with some difficulty; there is no portion of the work more excellent than the rest. The following anecdote—given also in other chemical works—may serve as an illustration of the belief in the transmutation of metals, once so prevalent:—

"In the preface to the Bibliotheca Chemica Curiosa, the following history of a transmutation, is given by Mangeters, on the authority of M. Gros, a clergyman of Geneva; with it I shall conclude this short sketch of alchemical absurdity, and pass to a notice of some of their far more philosophical contemporaries.

"About the year 1650, an unknown Italian came to Geneva, and took lodgings at the sign of the Green Cross. After remaining there a day or two, he requested De Luc, the landlord, to procure him a man acquainted with Italian, to accompany him through the town, and point out those things which deserved to be examined. De Luc was acquainted with M. Gros, at that time about twenty years of age, and a student in Geneva, and knowing his proficiency in the Italian language, requested him to accompany the stranger. To this proposition he willingly acceded, and attended the Italian everywhere for the space of a fortnight. The stranger now began to complain of want of money, which alarmed M. Gros not a little, for at that time he was very poor, and he became apprehensive, from the tenor of the stranger's conversation, that he intended to ask the loan of money from him. But instead of this, the Italian asked him if he was acquainted with any goldsmith, whose bellows and other utensils they might be permitted to use, and who would not refuse to supply them with the different articles requisite for a particular process which he wanted to perform. M. Gros named a M. Bureau, to whom the Italian immediately repaired. He readily furnished crucibles, pure tins, and quicksilver, and the other drugs required by the Italian. The goldsmith left his workshop that the Italian might be under less restraint, leaving M. Gros, with one of his own workmen as an attendant. The Italian put a quantity of tin into one crucible, and a quantity of quicksilver into another. The tin was melted in the fire, and the mercury heated. It was then poured into the melted tin, and at the same time a red powder, enclosed in wax, was projected into the amalgam. An agitation took place, and a great deal of smoke was exhaled from the crucible, but this speedily subsided, and the whole being poured out *formed six heavy ingots, having the colour of gold.* The goldsmith was called in, and requested by the Italian to make a rigid examination of the smallest of the ingots. The goldsmith, not content with the touchstone, and the application of aqua fortis, exposed the metal on the cupel with the lead, and fused it with antimony, but it sustained no loss. He found it possessed of the ductility and specific gravity of gold; and, full of admiration, he exclaimed that he had never worked before upon gold so perfectly pure. The Italian made him a present of the smallest ingot as a recompense, and then, accompanied by M. Gros, he repaired to the mint, where he received from M.

Bacuet, the mintmaster, a quantity of Spanish coin, equal in weight to the ingots which he had brought.

"To M. Gros he made a present of twenty pieces, on account of the attention that he had paid him; and after paying his bill at the inn, he added fifteen pieces more to serve to entertain M. Gros and M. Bureau for some days; and in the mean time he ordered a supper, that he might on his return have the pleasure of supping with these two gentlemen. He went out, but never returned, leaving behind him the greatest regret and admiration. It is needless to add, that M. Gros and M. Bureau continued to enjoy themselves at the inn, till the fifteen pieces, which the stranger had left, were exhausted."

But while we are amused by the extravagancies of the pursuers of alchemical delusions, at those who sought for the means of converting every thing into gold—the philosopher's stone—and the means of perpetuating health and life—the *elixir vitæ*; let us not forget that to these fanatics of science we are indebted for many very valuable discoveries.

The present number affords an excellent means of comparison between alchemy and chemistry. This comparison is interesting and useful in the highest degree: it shows the progress of the science, from the dark ages of mystery, and of the monopoly of knowledge, to the enlightened days of the unsophisticated development of scientific truth, and of the wide diffusion of information.

We may add that this work is to be completed in twelve parts, and the author pledges himself, if the twelve parts be not sufficient for his purpose, to give a thirteenth gratuitously.

In conclusion, we may recommend the lectures to the perusal of our readers: beginners, especially, will find it an invaluable work.

Proceedings of the London Electrical Society, Session 1841-42. Edited by the Secretary, Charles V. Walker, Esq. No. I. London: Simpkin, Marshall, and Co.

These Proceedings will be hailed with delight by all lovers of electrical science, amongst whom we may reckon ourselves.

The science of electricity has recently received a fresh development from the discovery of the electrotype, and from the labours and investigations of Messrs. Spencer, Smee, De la Rive, Jacobi, Mason, Murray, Grove, Sturgeon, Daniell, &c. &c. &c.

The present Number of the "Proceedings" contains, among other highly interesting papers, the following important ones:—Mr. Pollock, on "the Nature of the Change of Colour of Bodies by Heat, and their Conducting Power;" a letter from Mr. Pine, describing "the effects of Vegetable Points on Free Electricity, and the position they thus occupy in the Economy of Vegetation"—a very clever article; and Mr. Walker, on "a Constant Acid Battery, with Observations on Electrotype Manipulation," which, for the benefit of such of our readers as devote themselves to electrotype operations, we give entire.

"At a time like the present, when the very attractive art of electrotype is insinuating itself into every circle, any information tending to simplify the process and render it familiar, cannot fail of being acceptable to the Society. As in all other arts, so in this, there is much to be derived from experimental acquaintance with the subject, which cannot by any possibility be deduced from theoretical analysis. Having had considerable practice in the art, I am induced to lay before the Society some of the conclusions to which I have arrived with respect to the nature and power of some parts of the apparatus employed.

"DIAPHRAGMS.

"First, With regard to the porous partitions, designated diaphragms, by which the two liquids of "the constant battery" are separated, none are more durable, and in all points better than those formed of plaister of Paris. Those of paper offer but little interruption to the passage of the electric current, but are not capable of entirely preventing the mixture of the two liquids, the consequence of which is, a great destruction of the zinc by *local* action. There is also with these diaphragms a great and extravagant deposit of copper within the folds of the paper; they are also very disagreeable to handle: the same, in a less degree, may be said of animal membrane. Those of wood, I have never employed, because there are many things equally serviceable, and attainable with greater facility. Among these, rank first those composed of biscuit ware, a delicate porous material, and those formed of pipe-clay. For experiments of no long duration, these are very useful; they effectually keep apart the two liquids, and readily admit the voltaic action to pass. But when these are used for any length, even a moderate length of time, their pores become filled with the metallic copper, and thus are rendered in a great measure useless. I have examined the fracture of some that have been in action for many weeks, and the structure has presented as much the appearance of a *conversion into* copper as that of petrified wood does the appearance of stone.

"Those formed of good *fresh* common plaister of Paris,—that used by builders—are less liable to these objections. I have now [May] by me a set of nine, formed from a bag of this plaister, which was new and fresh (the freshness for this purpose being an important point) some of which have been in constant use since the middle of February last. One of them I have particularly noticed: I had it on the table, in illustration of a lecture on electrotype,

delivered in the early part of March. It had then been fourteen days in action, and was free from all defect. Since that time it has been used with little respite, and is now to all appearance as fitted to endure as it was two months ago. The others are in the same good condition. I would not be supposed to speak of these as indestructible, for, like all things, they yield to 'Time's destructive hand,' but not till they have done ample service.

"These diaphragms may be made of any shape; those I am in the habit of using for batteries employed to copy medals of the various sizes are 6 inches high, and 3½ by 2½ external diameter. They are cast in a mould of sheet copper. The little resistance they offer to the passages of the voltaic current may be judged from the fact, that I am in the habit of making medals in a *series* of six or eight;* and the power will pass through the six or eight cells containing them, and produce a thick deposit in less than three days.

"BATTERIES.

"The selection of a battery depends upon circumstances over which the experimenter may have no control. If he wishes in a short time to copy a small object, such as a seal, the best and simplest form is that termed *the single cell* apparatus. It is nothing more than to pour a saturated solution of sulphate of copper containing a little sulphuric acid into an earthen jar; to place in this one of the plaister or other diaphragms, containing water rendered slightly acid, and then to insert a wire bent U shape, having the mould at one end, and a piece of zinc, either amalgamated or not, at the other; the zinc being, of course, placed within the acid, and the mould within the sulphate of copper.

"This will not be found to answer, when the object to be copied is large. The solution becomes so soon exhausted, that a change takes place in the character of the deposite. It may not be uninteresting to the members of the Society, especially as the subject was introduced before, when Mr. Mason made known his improvement in the process—it may not be uninteresting to say a few words on the causes which influence the character of the deposites; because the disclosure of these will furnish the experimentalists with a guide to direct them in their pursuits, especially should unfavourable results occur. It was thought that the rotten deposite,—a characteristic with which all who are but just initiated into the art are familiar, resulted from the presence of the sulphate of zinc among the sulphate of copper.† That this is not the case may readily be determined by merely pouring a little of the former solution into the latter, when it will be found that, according to the admirable laws which regulate these actions, the copper will be deposited pure and firm.

This may also be determined by using a *brass* plate in a decomposition cell, when the zinc contained in the brass will remain behind in the solution, and the copper alone will be released. The real cause depends on the relation subsisting between the generating power, dependent on the action between the zinc and the acid; and the strength of the solution of sulphate of copper, on which this power is exercised. If the latter is well saturated, the copper will be released pure and firm; if it is almost exhausted, the hydrogen gas will be released with the copper, and the deposite will be a dull *powder*. In the wide range between these two states is found the brittle deposite; it appears under many varieties of forms according as the solution is nearer to a state of saturation or to one of exhaustion, on the one hand, or according to the energy or weakness of the affinity between the zinc and its exciting solution on the other.‡

It is not an easy matter to supply crystals in proportion to the copper released from the solution, if large objects are being copied. For these it is decidedly necessary to use an additional cell, and to select a battery in proportion to the work to be performed.

Professor Daniell's constant battery is the most generally useful, especially where a series of medals are being copied. Where only one object is to be copied, or objects contained in but one decomposition cell, Mr. Smee's battery will be found very useful. But so far as I have yet experimented, the action of his upon a series of medals is very far slower than that of an ordinary constant battery.

"The simplest and best form of a constant battery may be obtained by an easy application of the art itself of electrotype. It consists in coating the interior of an earthen jar with copper, released from a solution; and it is effected in the following manner:

"Take a large jelly-pot,—one to contain a quart will do very well: place in it a few pieces of wax. Then, stand it by the fire till the wax is entirely melted, and the vessel has become exceedingly hot; after this, turn it about, so that the wax will adhere to every part of the interior; pour off the remaining wax, and place aside the jar to cool. When it is quite cold, brush the wax coating with black lead, until the whole is well covered. It is requisite for this purpose to be acquainted with the nature of the black lead employed:

* Vide "Proceedings of the Electrical Society," April 7, 1840, p. 203, note. 4to.

† Ibid.

‡ "This latter condition exists in a modified form, when a *large* piece of zinc is used, with a *small* object to be copied. The deposite is very *hard*, but not tenaceous. It may be easily broken in copying seals and such like small objects; little pieces of zinc an inch square are quite large enough."

some specimens are far inferior to others: it is not unfrequently found that the common article, used for domestic purposes, is better for this, than the finer and purer sorts. When the vessel is coated well, pour in it a solution of sulphate of copper, and place within this a porous diaphragm, containing acid water. In this put the amalgamated zinc, and bend its wire, so that it shall press upon the blackened surface of the jar; after a few hours' action, the jar will be coated with copper, and will form a very efficient generating cell, to be excited in the usual way.

"Of the application of this cell a very important modification may be arranged, by converting it into an ACID *battery*, analogous to the platinized silver of Mr. Smee. Those who are acquainted with the ingenious device of that gentleman, are aware that the characteristic of his arrangement is, that the negative plate, where hydrogen is released, shall part with this hydrogen very readily. Under ordinary circumstances, the hydrogen adheres very much to the plates of an acid battery, and throws a considerable portion of the plates out of action, by its presence on their surfaces. To remedy this, he has, as he terms it, "platinised" the surfaces. This process consists in throwing down from a solution of platinum this metal, in a finely divided state, on a surface of the negative state. The effect of this is, that the immense number of exceedingly small points offer so many facilities to release the hydrogen, and prevent its adhering to the plate. This process of Mr. Smee's was followed out in the construction of a battery for electrotype purposes, from the generating cell I have just described.

"The cell, as already mentioned, will be found to contain a *brilliant* coating of metallic copper, as released from the cupreous solution; this coating presents a surface consisting of myriads of minute glittering points, and is thus in a degree analogous to Mr. Smee's battery. But the analogy may be carried out still further, for if the deposition of metal is allowed to continue until the solution is exhausted, the surface will become black instead of bright, and will consist of much more minutely divided particles. This cell may be used with amalgamated zinc, and one solution of acid water. Its action is slow but constant. The zinc remains clean till it is entirely consumed; there is no need of re-amalgamation; the mercury appears to return to the operator, and, which is most important, the work produced is of the *finest* and *firmest* description. I have experimented for very many months, but *never* produced finer or better deposites than with this battery. I have mentioned that its action is slow, and therefore when time is an object, its application is not profitable. Generally, I should estimate that it requires *twice* the time of an ordinary Daniell, but when this can be allowed, the result will repay the sacrifice. I have paid sufficient attention to the action of this arrangement to enable me safely to recommend it as the *best* form yet suggested for *coating* objects. For this purpose, it is absolutely requisite that the deposite should be so *fine* as not to disfigure the object experimented on, and so *firm* as to be secure against the ordinary accidents to which it may be subject. These batteries, like those of Mr. Smee, are not so applicable in obtaining a series of copies; for the obstruction of the interposed liquid greatly retards the action of the battery, and the operation proceeds but slowly."

"I must not omit to mention, in the description of the *constant acid battery*, that I employ the porous diaphragms, although there are not two different liquids to separate. My object in this is to keep that portion of the solution which is becoming saturated with the sulphate of zinc, apart from the other. This prevents the possibility of the zinc becoming deposited on the surface of the copper. And when that portion is saturated and removed, its place can be supplied with fresh, without disturbing the other.

"Batteries of this description are readily connected with the cells containing the objects of experiment, by means of a wire simply bent and pressed against the copper coating: a slight connection is sufficient. And here it may be useful to remark, that in electrotype manipulation, the failures in nine cases out of ten result from the power of the battery being too *strong*, and not from its being too *weak*. The brittle and rotten deposites are the results of this: the nature and relation of these have been elsewhere treated of. There are many laws connected with the production of metallic deposites which are far from having yet been established. The watchful experimenter will daily glean much instructive truth, — the thoughtful one will deduce many conclusions. Whilst speaking of this very convenient battery,—convenient whether used as a constant Daniell's or a constant ACID battery, a few words may be said on the subject of the zinc plate,—on its size. The plates I employ are when first cast, about 1¼ in. by 4 in.; as these diminish in size by use, their relation to the copper plate is altered, and the result is evidenced in the nature of the deposited copper. It is pure, but in large grains. Therefore it is requisite to have the zinc element,—in fact to have the battery cell, for the zinc constitutes the very essence of this cell,—of a reasonable size. BATTERY CELLS MUST NOT BE TOO SMALL. They may be *weakly* excited, rather than too small. The size may be estimated from the observations given in the former part of this communication."

MOULDS.

"From the latest experiments, I am led to

adopt *three* substances for obtaining moulds of moulds or other objects,—*fusible metal, wax and stearine*. The first for small medals, the second for plaister casts, the last for larger or small medals. There is much more trouble attending the use of the fusible metal; many repetitions are necessary before a perfect cast is obtained. The advantages in favor of it are, that the moulds obtained furnish medallions with a rim, adapting them for being mounted. This rim cannot be obtained in wax and stearine moulds, without much trouble. The best mode of manipulating with fusible metal is what the French term *clichées*. The metal is poured on a sheet of paper, and is stirred well together with two cards till it is about to solidify; at which moment the medal is pressed sharply into it, and held firm till the solidification occurs. The object in view in stirring is to break the crystals. The casts thus obtained are very fine.

"In using wax on plaister casts, the main secret consists in not applying it too hot, lest it should find its way into the plaister and tear the cast in the attempts to remove. I have elsewhere published the mode of *preparing* plaister casts for the reception of wax,* and shall not detain the Society with a recapitulation here. Since writing those remarks, experience, purchased by the destruction of not a few good casts, has taught me to use the wax at a temperature just high enough to keep it in a fluid state. If the wax is used to copy works in metal, it must be kept in the fire some time after it is melted, and the metal must be previously warmed. But as there is always a trouble in removing wax from metal, it is better to devote stearine to this purpose; it is not so expensive an article, and is very rarely found to adhere. To facilitate the separation between stearine, or wax and metal, the latter may be polished when practicable with common black lead, and the advantage will be readily perceived.

"With these observations I will conclude the present communication. I am still engaged with further experiments, and hope soon to furnish the Society with fresh information on this alluring and interesting science."

Mr. Walker exhibited to the Society a battery cell, and plaister diaphragm, constructed on the principles described, and explained the mode of manipulation.

In conclusion, we advise our readers to purchase this very interesting periodical: they will derive much valuable information from it.

* Vide "Electrotype Manipulation," second edit. p. 15.

MORTON'S APPARATUS FOR THE DETECTION OF ARSENIC.†

To the Editor of The Lancet.

SIR:—

At p. 585, vol. i., for the present year, you obligingly inserted a description of my method for detecting arsenic by the aid of galvanism; the principal feature of which was, that by it I had removed one of the two objections that have been raised to Mr. Marsh's mode of obtaining nascent hydrogen as a test for arsenious acid, namely, the action of dilute sulphuric acid upon zinc: the objections resting on the fact, that both this metal and sulphuric acid have occasionally been found to contain arsenic. Since then I have endeavoured, by an alteration in the apparatus, by which it is at the same time simplified,—to do away with the necessity of using sulphuric acid as well as the zinc, thus obviating both objections, and I hope I have succeeded.

The alteration consists, firstly, in having but one tube instead of two, and this is much larger. The advantages resulting are, a greater quantity of gas may be collected for examination, and the froth that forms when organic fluids are operated upon, more readily falls. Secondly, the electricity enters by means of a number of pointed wires instead of pieces of platinum foil, and thus the decomposition of the suspected fluid is more quickly effected. I need hardly say that the analyst must be careful that the *negative* electrode, or zincode, of the battery, is connected with the gas-receiver, otherwise the arseniuretted hydrogen that may be evolved will be lost. The oxygen is allowed to mingle with the fluid in the outer vessel.

I confess that I have not found any agent that liberates such minute quantities of arsenic as sulphuric acid does; therefore, when this can be obtained *absolutely pure*, I should prefer it: yet as much of this acid now met with in the shops contains arsenic, from iron pyrites being used in its formation, it is extremely desirable that some other agent should be substituted.‡ After trying a great number of substances, I find that pure potash, or its carbonate or nitrate, may be advantageously made use of instead. The advantage is, that the arsenite of potash formed is much more soluble than arsenious acid. About two drachms to a pint of the solution I have found sufficient.

The plan to be pursued in cases of suspected poisoning by arsenious acid is thus rendered sufficiently simple. It is this:—portions of the stomach that have been corroded by the acid,

† From *The Lancet*.

‡ In twenty fluid ounces of this acid examined by Mr. G. O. Rees, he found 22·68 grains of arsenic; and Mr. H. H. Watson, in the like quantity of another sample, calculated the existence of no less than 97·416 grains.

or the contents of this viscus, or parts of any other organ in which the poison accumulates, are to be boiled for half an hour in distilled water, to which some potash or its carbonate is to be added. The solution being placed in the galvano-arsenical apparatus, it is to be connected with a galvanic battery. The one I have used in my experiments is on Smee's principle, having ten pairs of plates, five inches square, and excited by diluted sulphuric acid in the proportion of one part of acid, by measure, to fourteen parts of water. A Wollaston's answers very well. The first portions of gas that are given off, being principally hydrogen mixed with the atmospheric air in the tube, may be allowed to escape. That which is subsequently disengaged is to be tested in the ordinary way. Orfila considers it sufficient that the metallic spots are dissolved in excess of nitric acid, which converts the arsenicum into arsenic acid; to this nitrate of silver being added, a brick-red precipitate is thrown down —the arseniate of silver. M. Lassaigne proposes the arseniuretted hydrogen pass through a solution of pure nitrate of silver; which becoming decomposed, the silver is precipitated in black flakes, and arsenious acid is produced, mixed with the excess of nitrate of silver. This excess of nitrate of silver is to be decomposed by hydro-chloric acid; and the chloride of silver thus formed, and the metallic silver, are to be separated by filtration. The filtered liquor being heated, the nitric acid which it contains reacts on the arsenious acid, and converts it into arsenic acid; the properties of which are to be ascertained by the usual methods. Lassaigne is of opinion that by this means one grain of arsenious acid may be detected when dissolved in eighteen gallons of water, or in the proportion of one-millionth part. It would be very easy to cause the arseniuretted hydrogen to pass up through a solution of the nitrate of silver, by removing the jet, and attaching a flexible tube to the stopcock in its place.

Trusting that the above apparatus may prove available in the hands of the medical jurist for its intended purpose, I beg to subscribe myself, most respectfully, yours,

W. J. T. Morton.

Royal Veterinary College,
May 1, 1841.

II. CHEMICAL MANUFACTURES.

MANUFACTURE OF BLACK EARTHENWARE.

To the Editors of The Chemist.

Elland, near Halifax, July 13, 1841.

Gentlemen:—

Since it has been suggested to me by several of your readers that a short account of the manufacture of black earthenware, as it is extensively carried on in this parish, would not be unsuitable for your valuable publication, I have determined to follow out the suggestion in as concise a manner as is consistent with a clear exposition of the process.

That manufactures of this nature should have been so long and so successfully pursued, may be explained by the great prevalence of aluminous deposits in the vicinity of Halifax, a clayey soil constituting, according to the best authorities, more than one-half of the cultivated land, and a considerable portion of that which is unenclosed. Bricks, too, are made in vast quantities, but since their manufacture is so simple and well-known, I shall confine my observations to that of earthenware alone.

The numerous hills, which serve to diversify the scenery of this and many other parts of Yorkshire, are the principal seats of this species of manufacture, the clay here being of a superior quality, and admirably calculated for the purpose. After first paring away all the greensward, turf, &c., from the surface, the clay is then dug up, and put into what the workmen term *pits*. These are holes about three yards square, from which clay had been previously taken. Here the clay is broken down and mixed with water until it assumes somewhat the consistence of thin paste, or "stir-about." The grosser materials are allowed to subside, and then the water, holding in suspension the finer and purer portions, is passed through wire sieves into similar pits, where it remains during the whole of summer, that the fine clay may precipitate, and that the superabundant liquid may evaporate.

The aluminous deposit is now dug up, and conveyed to the pottery, where it undergoes an operation called tempering, which consists in moving it backwards and forwards, and kneading it. From the tempering room it is taken in small quantities, and rolled on a smooth stone in the manner that bakers knead and roll their dough. After this it is weighed into portions, varying in bulk according to the vessels which are to be made. Each lump in succession is now placed on the potter's wheel or lathe, and moulded by the hand of the workman into the desired form. This lathe is an antiquated piece of machinery, and consists of a circular plate of stone, fixed horizontally on the top of a revolving upright shaft, to which motion is communicated by means of a windlass. The windlass is worked by the hand. The workman in the formation of his

wares, is of course greatly assisted by the centrifugal force which the motion of the wheel developes. The different articles thus moulded are in summer dried in the open air, but in winter, or during rainy and damp weather, on shelves arranged around and in the vicinity of the furnace. When they are sufficiently dried, which the workmen know by their appearing white, becoming light, and emitting when struck a dull sound, they are arranged within the furnace, where they are subjected to a white heat for forty-eight hours.

The furnace in shape resembles a bee-hive, around which in the inside are fixed shelves supporting the manufacture. Along that portion of the furnace adjoining the ground, the fires are placed in what the workmen term boxes. Each of these has an aperture at the top for the admission of fuel, and another looking internally, through which the heat and blaze pass to ascend up the centre of the furnace, and thus go out through a chimney at the top of the cone.

After the ware has remained the usual time, the fires are allowed to go out, and on cooling the manufacture is withdrawn through a large opening in the side of the furnace, which had been previously built up with fire-bricks. Before the pots are placed in the furnace, I ought to have mentioned that they are first stained on the inside, and in a great measure over the outside, with a liquid having suspended in it a mixture of powdered galena and peroxide of manganese. This operation is effected on the outside by means of brushes, but on the inside by whirling the vessel rapidly on the potter's wheel whilst containing a small portion of the said mixture. The heat of the furnace afterwards, by partly reducing the metals, gives to the manufacture that glazed appearance which it then possesses.

The laborers employed at these places include males and females, and notwithstanding the cold and wet to which they are so constantly exposed when handling and kneading the clay, they seem stout and healthy, and often live to a tolerably advanced age. Neither does the high temperature of the furnace, which is in action about once a-week, injure them materially.

The moulding is invariably performed by a man well skilled in the art, and the delicacy of touch which these persons evince, whilst at work, is truly astonishing.

Ware of this description is comparatively cheap, a cart-load scarcely exceeding a pound in value. Its cheapness opens for it a ready market with the lower classes, amongst whom bottles, bowls, mugs, and pitchers are in constant demand. Nor is this sort of ware confined to Yorkshire. I have observed it in almost every part of the kingdom, though in some places a preference is given to the salt ware made at Rotheram, the glazing of which instead of being black or dark olive, is generally light brown and yellow.

Potteries of this kind, arranged as they are on the loftiest hills, usually form a peculiar feature in the landscape, and during the night when the furnace is in brisk action, the ruddy flames which ascend from its dome, serve as a sort of beacon and companion to the weary traveller. Often have I experienced the value of such a light in journeying where my medical duties called me.

When the clay in the vicinity of the pottery begins to fail, the manufactory is removed to where this material is more abundant. I have witnessed several removals of this kind. The source of the wealth of many families once resident in this neighbourhood, has been the manufacture of black earthenware.

I had intended making a few observations with respect to its antiquity. This however would be taking upon myself an unnecessary task, since in all likelihood most of your readers are perfectly familiar with this interesting part of the subject.

I am, Gentlemen,
very respectfully yours,
JOHN S. HILEY, M.B.

DESCRIPTION OF AN APPARATUS FOR INCREASING THE ILLUMINATIVE POWER OF COAL GAS.

BY T. W. NAYLOR.

IT is a well-known fact, that carburetted hydrogen owes nearly all its illuminative power to the accidental admixture of a certain oily vapour which is given off during the decomposition of the coal in the retorts; being aware of this, it occurred to me that if the gas could be more strongly impregnated with a similar compound, the flame would be increased in intensity, which I afterwards found to be the case.

The apparatus consists of a brass reservoir or chamber attached to the end of the gas-pipe, near the burner. This reservior may be in the shape of an oil-flask, made air tight, with a screw joint or other means of supplying any highly volatile oil, turpentine, or mineral naphtha, and should be kept about half full. Into this reservoir the gas-pipe ascends a little above the surface of the oil; a very small jet-pipe of gas, regulated by a stop-cock, is branched off below this chamber, to supply a minute flame, so as to cause a sufficient evaporation from the oil to unite with the gas in the flask receiver. The whole is of course surmounted with the usual burner and lamp glass.

By employing this apparatus for burning coal-gas, the intensity of the flame will be very considerably augmented, consequently the same degree of light may be obtained with

a far less consumption of gas, a point which I consider of some importance. It may be also employed for burning those varieties of gas obtained by the decomposition of several of the anthracites, bituminous earths, wood, &c. which could not be otherwise employed with any advantage for the purpose of illumination. In conclusion, I may remark that the apparatus, from the simplicity of its construction, might be manufactured at a very trifling cost, possessing likewise the advantages of being very compact and neat in appearance.

III. PHARMACY, &c.

MEDICAL REFORM.

How far the late elections have terminated according to the hopes of the select few who occasionally pour forth their eloquent lucubrations in Exeter Hall against "ignorant chemists and impostors," we leave time to prove; and that, we feel convinced, will show that they have lost a great portion of their patrons. Their stratagems and devices, their threats, placards, and labels have all proved useless; their handful of votes and atom of contest have now sunk, to rise God only knows when, nor have they now any one to fly to in their troubles.

The ideas of this little band of twaddling knaves being able to obstruct, or even to influence the general feeling was too ridiculous a farce for the conception of any brains but their own. What course will they now pursue? Surely they will not venture a second time to impose their humbug on Mr. Hawes? and we are quite sure that they will find no one in the New House of Commons very ready to hazard his reputation merely to please an insignificant group of unemployed and disappointed men, who, because they have neither intellect nor knowledge sufficient to make themselves respectable, are resolved to "die game," and to put forth their last efforts to become at any rate notorious.

All coercion—all devices to frighten both candidates and voters—are for some time, at least, at an end; and therefore we hope to see professional men devoting their time and talents to the acquirement and diffusion of knowledge, rather than scrambling for the "loaves and fishes." We urge them to imitate the honours and distinctions of the Hallers, the Campers, the Harveys, and the Hunters, and not to draw down upon themselves the odium cast upon their craft by Shakspeare, in *Romeo and Juliet*,—"The caitiff wretch, the beggarly account of empty boxes, thinly scattered to make up a show," are ugly sounds.

We would remind these reformers, that what they are seeking to obtain by foreign means is to be acquired only by those immediately within their own power, and through no other agency, namely, personal merit and distinction in knowledge. Such are the surest means of pursuing fame, and the most honourable means of seeking fortune. Were the attainment of knowledge held up as the sole source of distinction, and were close and accurate examination employed to ascertain the absolute qualifications of graduates, the differences now being contested would certainly be settled, and the profession might hope soon to take its proper rank in the scale of science and popular esteem, and its professors would stand untainted with the imputation of craft, ignorance, and cupidity: they would not only deserve, but gain, by knowledge and public respect, those advantages which they are struggling to coerce by law.

The whole system of education in the science, from beginning to end, is bad; the means of examination, worse; and the men who are entrusted with those important offices, objects of pity and contempt. Instructions and examination ought to go together in one regular course of succession, in order that not only the attainments but even the attention and the application of the pupils to the study of their profession may be known and judged of; for, according to the present method, by the time that the investigation of their knowledge is made, what they have not absolutely neglected during their instruction (and really it is difficult to say what part this is) is forgotten, so that at the end of the period of their learning, they know little or nothing,* yet are they

* Will our readers believe it possible, that through the present cruel ignorant and con-

somehow or other admitted at the Hall and College, and passed off as enlightened members of a liberal and important profession.

Would it not be a much more enlightened and liberal arrangement, and one much more conducive to the comfort and advancement of the student, to be subject to admonition and reproof for negligence and misconduct, concurrently with his pursuits of scientific knowledge, than to total rejection and lasting disgrace, at a time when he is at the close of his career of learning, and about to enter into life, when of all other times he should not only be free from stain of character, and imputations of ignorance, but should appear "with all his blushing honours thick upon him," and not be for ever blasted. That system of teaching and ascertaining the acquirement of learning by pupils is alone of worth, and entitled to respect, which corrects and reproves, and does not disgrace and destroy. Little need we say of the qualification of the great mass—(it is a mass—*rudis indigestaque moles!*)—of medical men: is there in fifty, or, indeed, in five hundred, ONE who knows scientifically any thing about medicine? Are there not ninety in every hundred who are even making fortunes, who have no legal qualifications from either College of Surgeons, or Apothecaries' Hall,—little protection as they afford?*

temptible method of teaching and examining, out of eighty candidates lately brought up, for probation at University College, more than thirty, *i.e.* nearly one half, were rejected! Would this, we ask, have been the case, if the method we have laid down were adopted? It is too easy to see the consequences to the rejected, if any of them should fix their destination near that of their fellow and more fortunate candidate: they may be sure that the story of their being turned back will be circulated to the advantage of those who have been accepted, more through chance, we are convinced, than knowledge. but to the injury of the feelings and eternal stigma of those rejected by a set of drivellers, at whose hands a diploma is a memento of contempt and ridicule.

* The apothecaries, it seems, still have the power to prosecute unauthorised persons, and they exercise it once in twenty years, in doubtful cases, and pass by hundreds where it is required.

The College of Surgeons has no power to prosecute persons practising surgery without their diploma: hence all the proceedings at Saw-bone Hall are a mere pantomimic exhibition. One of their farces has lately been played off in the presence of several of the bishops, Sir Robert Inglis, and others of the same clique. An oration has been delivered, in language, for which, if the orator had been at a public school, instead of being at the show-room in Lincoln's Inn Fields, he would have received a certain number of stripes upon that part of his epidermis which immediately covers the glutæi. Dr. Johnson observed that, "if the birch were prohibited the boys would lose as much at one end as they gain at the other." We suppose that the punishment is considered, according to his doctrine, and that of Butler, to be most effective by being confined to that part, for there is as much reason to suppose that stripes are felt in the same ratio as kicks—

"For kicks, they say, in that part more
Hurt honour than deep wounds before;"

because it is—

—"The seat where honour 's lodged,
As wise philosophers have judged."

Let any one take the small pains to enquire into the education and qualifications of the host of low practitioners at the east end, and suburbs of London, and other crowded vicinities; he will soon discover a delectable *mélange* with which to enlighten the public, who perhaps are not aware, that it is a sort of medical jobbing, "a good bit," to set up a shop in such places, and one which will soon enable the fortunate adventurer to ride in what their wives generally call a *shay*.†

Unfortunately for the middling class, which forms the great bulk of society, these men, viz. the apothecaries—between whom and the enlightened pharmacien of France, there is a melancholy contrast—are those to whom all who cannot afford the exorbitant fees of physicians, are compelled to have re-

† In the time of Hogarth, a shop in Gin-lane must have been a fine "spec." Why not attach one to the posterior of every gin palace? We see nothing in such an arrangement more strange than that Henry the Seventh's chapel should be at the extremity of Westminster Abbey, like the tail or os coccygis of the building.

course for advice in medical cases, with the exception of such as are attended with danger, in which "further advice," as it is called, is resorted to. In cases of surgery, the poor go at once to hospitals; and all who can raise a guinea very properly refer their cases to some surgeon of known education and eminence.

Can any one who takes the pains to think on these subjects (which indeed are serious ones to all who have the desire to see justice done to the community) fail to observe the dire necessity of a total and immediate revolution of the existing state of medical education, government, and practice?—can he be so blind as not to see that in this profession, except among physicians and hospital surgeons, there exists no public mark by which to ascertain who is who,—the scientific man from the mere dolt and the illiterate mountebank? Success in business is perhaps the worst test: for ignorance is always remarkable for intrusiveness and assurance; while sense is retiring and modest.

It is argued,—Are not the examinations at the hall, and the certificate of the qualifications there given, sufficient guarantees of the acquisitions of the pupils? We reply No! They are a perfect farce —a libel on common sense, and a complete delusion to the public: their pharmacopœia is a patchwork of inaccuracy and bungling. Any sort of questions, extemporary, are proposed, and the pupils feel, when they get their authority and diploma, that their knowledge has been as little ascertained as if they had never been examined at all. We contend that a complete and thorough examination at stated periods, upon each subject separately, can alone develope the state and degree of the pupil's knowledge and application to his profession: anything short of this is worthless, because a pupil may be passed or rejected at the caprice and temper of the ignoramuses who are entrusted with the office of examiners. Were the questions laid down by a proper rule, there could be no error, no sense of injustice, nor cause of disapprobation: the stigma could no longer be felt by the candidate, and his animosity to the examiner would therefore be for ever at an end.

If the medical profession in this country were in the same respectable state as regards the knowledge of its members, as it is in France, Germany, and in Scotland,—were the individuals as much to be distinguished for their classical as for scientific knowledge, they might indeed call for some check upon any unfair encroachment upon their rights and emoluments by Chemists and Druggists: but when we know that, taking them generally into the account, by far the greater portion, namely, the lower rank, or what a contemporary calls the "working class," they will be found to present to the mind a very apt illustration of the vulgar simile of "the pot and the kettle," in which the blackness is far greater in the former, than in the latter vessel.

We cannot conclude our observations without expressing the pleasure we feel, that the step has been adopted which we so strenuously urged in our first number, and which we have continued to advocate in subsequent ones, namely, the formation by chemists and druggists, of a society for the protection of their rights, and for the instruction of their pupils in those branches of science connected with their pursuits. We cannot, nor will we, yield the priority in this advice to any one: we have received from the meetings of the trade in the provinces, the most cordial thanks for, and approbation of, our interest and zeal in the promotion of its welfare, respectability, and advancement. Our journal has been commenced solely with the view of furnishing them with the means of expressing and redressing their grievances and oppressions, and of laying before them all the improvements in chemistry, chemical manufactures and pharmacy, in this country, and on the Continent, occurring within the period of publication.

The Chemist cannot fail to be of the greatest importance to all who follow the profession of pharmacy, of whose cause and rights it has been the first and chief advocate in the hour of need and danger, against the devices of the enemy and the oppressor.

To make the pages of our work the mere vehicle of colloquial news, the organ of trivial concerns, or the medium of commercial controversy, would be utterly derogatory to the character of a scientific record, and beneath an association with the subjects of which it treats.

The interests of our readers are best consulted by the selection of subjects through which to advance them in the sciences with which they are connected; and by making integrity of character and attainment of knowledge their just title to the rewards of public confidence and protection. The steady pursuit of

such objects on their part, will gain them respect and esteem, and ensure to THE CHEMIST the continuance of that approbation it has hitherto received.

MEDICAL REFORM, AS AFFECTS DRUGGISTS.

LETTER V.

To the Editor of the Chemist.

GENTLEMEN:—

If Frenchmen and other foreigners are astonished and amused at the way in which small occurrences in the political world are here moulded into all the various and peculiar forms of *party*—are made the subjects of lengthy and sometimes furious and elaborate articles in our public prints; what must be their astonishment and amusement to find, on peeping into the medical periodicals, that the same legerdemain and wonder-working giant has a game to play even there! Accordingly in the "leading journal" of the "medical press" two or three weeks back, we are informed that the "advent of the Queen to the throne" has had a most "beneficial effect in bringing about principles"—of what does the reader imagine?—of some new and grand state policy?—some momentous revolution in the commercial and financial condition of the country?—some reform in the representative system?—nothing of the kind. The "accession of the Queen" (who is said to have a "steadfast heart that does not quail in carrying out principles," &c.) "is likely to be of the greatest assistance in helping on the cause of no smaller a matter than MEDICAL REFORM!"

In what manner our gracious Sovereign may purpose to wield the staff of Esculapius, along with the sceptre and other regalia of her high office the writer sayeth not; but that strength of arm, as well as "steadfastness of heart" may be required, seems hardly to be doubted.

We have all heard, of course, ere this, something of Her Majesty appealing to the "sense of the country" on the question of corn, sugar, and timber; monopoly, or free trade; tory, whig, or radical. But we are now assured, that the general election will carry with it a decided "medical-reform feature" into the new House of Commons! Whether this signifies, that cheap physic is to be dealt out to those mal-contents who are likely to come short of the *large loaf* I do not know; and it is equally unintelligible to me that those "liberal" men who have been raving against monopolies of every kind during the last two months, should, nevertheless, avow their intention, as soon as they have the power, to fight up for a monopoly in physic—the most mischievous in principle, and tyrannical in operation. How far these worthies will succeed in their meddling interference with the personal and domestic concerns of the people—the people of humble life, who seem to be only as targets for the arrows of the rest of the world—remains yet to be proved.

That the tide of popular feeling is running against those crafty and scheming crochet-mongers, yclept medical reformers, is not to be doubted; that the keen eye of public discernment is able to see through the flimsy gossamer that covers, but does not conceal their selfish principles and intentions, is also not to doubted. They have been denounced by public journals of every party, and all shades of politics. The *Morning Post* and *Herald* were foremost to unmask their presumption. The *True Sun*, the *Sunday Times*, and other liberal papers could not leave these pseudo-liberals unscathed. The *Weekly Dispatch*, which for certain religious (?) reasons has always supported the medical profession, not only could not be a consenting party to the scheme, but in the most handsome and disinterested manner came forward (unsolicited) to denounce the abandoned imposition upon the liberty and pockets of poor people; yea more, the unprincipled attack upon the interests of chemists and druggists.

There is a certain infirmity (and I am sorry for it,) that seems to be frequent and almost indigenous to certain sections of radicals in this country. It is the unfortunate tendency of sublimating reason into presumption. The Political Unions, the National Convention, the Charter (Magna, secunda) are not unapt illustrations of this.

Among the causes of such a propensity, is perhaps a love of distinction, under the pretence of equalization, and not a little, the appetite for mimicking the fashions of the upper classes. The medical agitators, compared to the political, are certainly mimicking *their* superiors in the matter of the Association, the delegates, the medical conference at Exeter Hall, the "long pull, strong pull," &c. for medical "reform," and their "charter" peculiarities. If the political radicals did not accomplish much, they certainly had the merit of producing what is called "a sensation." But in the case of these hapless prodigies of physic in the Strand—

"That strut and fret their hour upon the stage,
And then are heard no more!"

it is but sowing to the wind, with a prospect of reaping the whirlwind. I cannot find, as respects notoriety, that they are at all to be compared with their prototypes mentioned above, or even with the famed Wizard of the North, hard by.

And is the respectable average of the medical profession to be libelled by associating them with such a tribe? Heaven forbid! I firmly believe that the real medical prac-

titioner (by which I mean a man picked out by that most sagacious court of examiners—the public, for the treatment of disease,)—I say the *real* practitioner cares, perhaps knows, as much about "medical reform" as does his "celestial highness the lord of the chinamen" of our queen's attendants of the bedchamber.

Such an estimable character as a sound and upright practitioner of medicine, I do unfeignedly respect and reverence. But when we see, perversely driven into the pale of a noble calling, a clique of creatures that never were intended by nature for such a sphere—when a knot of individuals—the unconfided, the unnoticed, the rejected, or passed-by, of blunt and common-sense English people have the assurance to call themselves the representatives of the medical profession, it is time indeed for fearless observers to remind them of what they are—their origin, and process of formation—to wit, a dishful of inflated bubbles, produced by agitation.

I respectfully conjure the medical profession to wash their hands from all participation with these spouting and idle people, who seek only to beguile them from the more useful and blessed labour of visiting and healing the sick. Let them only adhere faithfully to the path of duty marked out before them, and they need have no apprehension, under a gracious Providence, of losing the rich reward that is due to their exertions; least of all need they fear any injury at the hands of chemists and druggists.

I remain, Gentlemen,
Your obedient servant,
W. G.

MEETING OF THE CENTRAL ASSOCIATION OF CHEMISTS AND DRUGGISTS OF WOLVERHAMPTON.

At a Meeting of the Wolverhampton Central Association of Chemists and Druggists, held at the Swan Hotel, on Friday, the 2nd of July, 1841, John Weaver, Esq. in the chair, it was—

Moved by Mr. Ford, seconded by Mr. Steward, and resolved:—

That the thanks of this meeting are especially due to the members of the council of the "Pharmaceutical Society of Great Britain," for their successful labours in bringing such a society into operation, which is calculated to prove so highly beneficial to the interests of the trade, and be the means of raising it to that eminence in the estimation of the public in which it deserves to be held.

Moved by Mr. Griffiths, seconded by Mr. Parker, and resolved:—

That the cordial thanks of this meeting be given to Mr. Jacob Bell, for his pamphlet of "Observations on the Pharmaceutical Society," which was read to the satisfaction of every one present, and that the secretary be requested to order two hundred and fifty copies for circulation in this neighbourhood.

Moved by Mr. Tonge, seconded by Mr. Fleeming, and resolved:—

That the thanks of this meeting be given to the Editors of "The Chemist," (a work which is entitled to the support of every Druggist) for so kindly devoting their valuable columns to advocate and defend the rights of the trade, requesting them to insert the proceedings of this meeting in their next number, as a means of encouraging others at once to come forward and co-operate with the Pharmaceutical Society in its great object.

Moved by Mr. Bew, seconded by Mr. White, and resolved:—

That this meeting unanimously agree to enrol their names immediately as members of the Society, and recommend the trade generally to adopt the same measure.

Moved by Mr. Jackson, seconded by Mr. Green, and resolved:—

That the members of this Association pledge themselves by every means in their power to forward the interests of the Pharmaceutical Society, with the view of obtaining for it universal sanction.

Moved by Mr. Gow, seconded by Mr. J. F. Seyde, and resolved:—

That the thanks of the meeting be given to John Weaver, Esq., for so efficiently performing the duties of Chairman.

J. F. Seyde, Secretary.

REVIEWS.

A Statement of Facts on the Subject of Medical Reform, Addressed to its Advocates and to the Public at large. By William Collins, Druggist. Bath: Simms and Son, George Street; Oldland, Corn Street, Bristol; and R. Hastings, Carey Street, London. 1841. pp. 15. 8vo.

Pamphlets without number have lately issued from the press, on the most important subject of Medical Reform. In these, the statements of abuses have, indeed, been of a most alarming character. That such numerous and flagrant abuses should exist in a profession to which the health and lives of our fellow-creatures are confided, is a circumstance which calls for prompt and efficient measures of reform; and the individual, whether physician, surgeon, apothecary, or druggist, who calls public attention to them, and who points out means of remedy must ever command our approbation and support.

The total inefficiency of the present system of medical government—the want of a proper and well-regulated plan of professional education—the entire want of qualification, owing to the insufficiency of the present examina-

tions, — and the consequent deficiency, or rather total absence, of protection to the public —are subjects which have too often been treated of in THE CHEMIST to require further notice on this occasion.

The pamphlet under notice is an additional evidence against the abuses existing in the present system of medical government, and the author has manfully and nobly performed his task. He divides his subject into three parts,—" the objects aimed at by the advocates of the proposed improvements ; " — " the equalization of the different ranks of the profession ;—the separation of the trade in drugs from the practice of medicine ;—and the preventing unqualified persons from practising." " Leaving the first proposal to those more qualified to decide on it"—he passes at once to the second, and, subsequently, to the third.

" This separation has chiefly been called for on the ground that it would raise the members of an honorable profession to a more dignified station, by freeing them from the stigma of being tradesmen. Desirable as this may be, there are reasons far more urgent, and far more important to the public." These reasons he gives in a very clear manner. We have room only for the following.

" It is plain, that however skilful the medical attendant, however judicious the mode of treatment he may adopt towards his patient— his abilities and care will be of no avail, unless the medicines he prescribes be prepared properly, and with pure drugs. Now, with the present system there is no security that this is done ; and the difficulty of insuring this important object, unless the preparation and dispensing of drugs be made an entirely separate and distinct occupation from the practice of medicine, can be easily shewn.

" In the first place, we need not search very far to see, that where those who supply medicines are responsible to no one for the manner in which they are prepared, and for the quality of the drugs with which they are compounded—where no enquiry is likely to be made as to the efficiency of the persons employed in dispensing them—there will be less probability of such extreme care, in either of these respects, as where the contrary is the case. According to the plan at present so extensively followed, these disadvantages exist in a great degree : the private dispensary of a " general practitioner" is a place secluded from the public view, the secrets of which no one thinks of exploring.* But now that the question of medical reform is agitated, and that more so by this grade of the profession than by any other, they too must expect the same free animadversion on any defects their system may present, which has been so liberally bestowed on others.

* * * * " I will conclude the examination of the imperfections of the present system, by asking, if it is not too serious a consideration, that though the anxious friends of the agonized sufferer may have procured the assistance of the first talent—that though those talents may be successfully exercised in pointing out what remedies would afford relief—there should be such a possibility, that want of proper attention in the preparation of these, may cause all their care to have been in vain, and doom them to see the object of their solicitude sink beneath a disease, which medical science had power to compete with, but which power was rendered unavailable by an unfortunate connexion with pharmaceutical incompetency. Is there not, then, a good foundation for the opinion exercised by the distinguished writer of the letter before alluded to? I presume the trade and profession of medicine must be separated ; our profession can never be respectable or respected, until this separation has been accomplished."

With regard to Mr. Collins' vindication of *The Lancet*, we can attribute it only to his having been overcome by the very *mild* terms in which it spoke of the first meeting of Chemists in London, held on the 15th of February, 1841. Has he read the subsequent false and scurrilous attacks on the body of which he is a member, which have appeared in that journal? Do not those attacks savour of disappointed malignity? Mr. C. says,—

" As to the severe language used by The Lancet, towards the druggists, they might feel more aggrieved at it, did they not observe that the most distinguished members of the medical profession are equally roughly handled by that watchful periodical, when any slight defect or dereliction of duty places them in its power."

Truly, the vituperation of The Lancet is chiefly levelled at the higher classes of the medical profession ; nor do they wait for " any slight defect or dereliction of duty.' The only class at which its venom is not levelled, is that in which most abuses exist ; we mean the apothecaries, who, instead of well merited reproof, find in " that watchful journal," an advocate, one too, which is willing to afford them the means of crushing a respectable body of men ; of riding rough-shod over the understanding and common sense of society, and of tampering still further with the public life and health.

This pamphlet should be read by all concerned in this great subject ; it is important and interesting, not only to the profession, but to the public, who will find in its pages an exposé of the manner in which the apothecary discharges his duty to society, when he is

* It is true that the Apothecaries' Company possess a power of examining drugs, but the occasional exercise of it, which has been confined to London alone, has been regarded as a mere form, and is well known to be perfectly useless.

endeavouring to maintain the present absurd system.

A Grammatical Introduction to the London Pharmacopœia, and a Key to Physicians' Prescriptions: containing a Latin Grammar: a Syntactical Analysis of the Pharmacopœia and Preface; and a Copious Vocabulary. By S. F. LEACH, *Classical Professor.* Third Edition. London: H. Hughes, 15, St. Martin's-le-Grand.

A MORE excellent little work than the one before us we have seldom met with. Having been published for some years, and having gone through three editions, it requires no remark from us to add to the estimation in which it must be held by those who have profited by it. We recommend it to our younger readers, to apprentices, and to medical students, as a means of acquiring a thorough knowledge of medical Latin, avoiding the irregular and unsystematic course generally adopted.

OBSERVATIONS ON URINARY SEDIMENTS.*

BY M. BATILLIAT.

THE composition of urinary sediments is so much the more useful to be known, as it indicates the treatment that should be adopted. Physicians should, therefore, on all occasions, demand the analysis of urinary concretions from apothecaries, whose office it is to apply their knowledge to the healing art. It is true that all are not equally *au fait* at this kind of experiment; but that arises rather from want of opportunity than from difficulties to be surmounted. Those who are thus situated will find all the necessary information in M. Chevalier's work entitled *Essay on the Solution of the Gravel and Calculi of the Bladder.*

In the course of my practice I have met with *urinary calculi formed of cholesterine.*† (*Journal de Chimie Medicale Nov. and Dec.* 1836.)

I am going to relate two cases which, if they present nothing phenomenal, may at least diminish the anxiety of some persons who attach too much importance to certain symptoms.

At the beginning of May, 1840, a man aged about 30, of good constitution, but who was some times troubled with rheumatic pains, remarked in his urinal a sedimentary deposit, which he did not again see; although there was but a small quantity of it, he collected it, and brought it to me for analysis.

It was composed of small, shining, brick-red crystals. The color diminished after pulverisation.

A portion of this powder, heated in a platinum spoon, gave out a strong urinary, animal smell. The residue, moistened with a little distilled water, communicated a green color to marshmallow paper. A small portion of this same powder, also heated on a sheet of platinum, with a drop of nitric acid, acquired a beautiful red colour, which was turned deeper by ammoniacal vapor.

Another portion of the powder of the sediment was heated in a porcelain capsule, with a solution of pure potassa. After being sufficiently settled, the liquid was decanted in order to separate it from some flocks, which were treated by nitric acid, which dissolved them: saturated with ammonia, the liquid gave a slight precipitate of phosphate of lime. The uric acid was also precipitated from its combination with the potassa, by hydrochloric acid.

From the above results, it may be concluded that the composition of these crystals was analogous to that of uric acid calculi; consequently, and although there was a total absence of all symptoms indicating the presence of calculi in the bladder, this person was sent to Vichy, to take the mineral waters. We shall judge from the other case whether this treatment was indispensable.

At the same time, another person also perceived that her urine deposited much sediment. I directed her to collect it, which she did with care and perseverance for a whole year.

The urine was received during twenty-four hours in the same porcelain vessel, where it was left for twenty-four hours longer. During this time, another recipient was used for the same purpose; the first was decanted, leaving the deposit in it, and so on, until there was sufficient in both vessels; the whole was mixed, washed several times, and dried.

Before speaking of the composition of this sediment, I may relate the following observations:—

The individual who passed the urine was a woman, aged about 53 years, who had never had any affections of the urinary passages, nor of the bladder, but who commonly suffered during the winter from rheumatic pains. When these manifested themselves, or any other indisposition, her urine became turbid and red; the same effect was produced by unusual exercise; but in all cases, it appeared and disappeared from the evening until the next day. In health, the urine was limpid, of a more or less deep amber color, according to the season, never carrying with it foreign bodies. Therefore it was only after it was passed that the

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* *Journal de Chimie Medicale, July,* 1841.

† Madame T—, who passed these calculi, is now in the enjoyment of excellent health, although her urine is occasionally accompanied with similar ones.

sedimentary crystals were deposited in it. Wishing to ascertain whether or not the sediment was formed under the influence of atmospheric air, I accurately filled a flask with urine as it passed from the bladder, and I sealed the flask with emery. Twelve hours after, there was a deposit exactly similar to that in the urinals: the liquid, poured into another flask, yielded a second deposit.

From this simple experiment, it is evident that the air does not exercise any influence over the formation of the sediment, and that it is only after a very long time that this deposit is entirely formed.

I should mention, that the smaller the quantity of urine is, as in hot weather, the more abundant is the deposit. This is also probably the reason why urine, passed after meals, deposits almost nothing.

I may add that the production of the sediment appears to be owing to the individual constitution, and not to the kind of diet, since this patient is the only one in her family affected.

The sediment in question was of a brownish red, granulated, and without a determinate form; it was almost insoluble in warm water, and ether did not dissolve it.

I treated ten grammes of it by known means, and I found it to be composed of—

Uric acid.....	9·50
A substance insoluble in caustic potassa	0·02
Water of crystallization and loss..	0·48
	10·00

The matter insoluble in caustic potassa was treated by nitric acid, which dissolved a small portion of it, which was precipitated in flocks by ammonia. The surplus, heated to redness, gave out an odour of animal matter, but it was not entirely burned.

This sediment is evidently entirely composed of uric acid, minus $\frac{8}{1000}$, containing traces of phosphate of line, animal matter, and a substance not acted on by nitric acid, which may be carried away by the air in vessels left uncovered.

QUANTITY OF SEDIMENT COLLECTED DURING TWELVE MONTHS.

1840.	June	5·60 gram.
	July	5·80
	August	10·00
	September.....	3·05
	October.....	1·60
	November.....	2·22
	December.....	1·90
1841.	January	2·60
	February	2·40
	March	3·10
	April	5·30
	May	7·23
		50·80

This quantity being increased by about $\frac{1}{8}$ for lost urine, the whole quantity for the year was 49 grs. 2 decig.

The emission of so large a quantity of sediment would have caused alarm in the case of a person not in good health. The individual in question, had not any indisposition during the whole course of the observation: only, in the months of December and January, she experienced some slight sensations of pain. The sediment collected during these two months, was not granulated and crystallized as in general; on the contrary, it was in fine laminæ, and of a brighter red. Its analysis did not present any distinguishing feature.

From the preceding it may be concluded:—

1st. That it is important not to confound gravel passed by the urine, with sediments formed in it by rest:

2nd. That it is necessary to study the nature of both:

3rd. That urine may deposit more or less abundant sediments, without the health being affected, and, consequently, that medical treatment is not always necessary.

POISONING WITH GUN-BARREL BROWNING.*

BY R. H. ALLNAT, M.D.

To the Editor of The Medical Gazette.

SIR:—

A few months since, as I was walking through the streets of this town, in company with Mr. Atkinson, surgeon to the Union, a respectable tradesman, of the name of Beckley, rushed up to us with a death-like countenance in a state of the utmost trepidation, exclaiming that "his son was poisoned." We immediately proceeded to his residence, and found a child, about five years old, sitting upon its mother's knee, making ineffectual attempts to vomit. He complained of a constant burning pain at the epigastrium, a peculiar sensation in the throat, and the pulse was feeble and quick. He looked listless and heavy, but was perfectly rational, replied promptly to questions, and was extremely obedient in adopting the measures of relief which we recommended.

It appears that his father, who is a gunsmith, had left a bottle containing "browning" within reach, and, during his temporary absence, the child had swallowed a considerable quantity of its contents. Gun-barrel browning is composed of bichloride of mercury, sulphate of copper, and the tincture of the sesquichloride of iron; a precipitate is the result of the union of these heterogeneous ingredients.

The first object was to neutralise the bichloride of mercury, if any existed in a free and uncombined state; to effect which, copious

* *Medical Gazette*, April 9, 1841.

draughts of milk, combined with whites of eggs, were administered. The successive doses, owing probably to the emetic action of the sulphate of copper, were ejected after short intervals, in a partially coagulated state. The poison having at length ceased to act upon the stomach, or the organ having become insensible to its action, a slight ipecacuan emetic was given, followed by draughts of milk: vomiting was renewed, the pulse became more natural, a gentle perspiration broke out, and the child was taken to bed, where he soon fell asleep, and awoke quite convalescent.

Remarks.—The quantity of corrosive sublimate swallowed could not have been very considerable, as a pint of the mixture contained only about a scruple of the salt, with the same weight of the sulphate of copper. All authors, however, agree in assigning dangerous properties even to a minute dose. Orfila, Campbell and Smith state that three, four, or five grains will cause death in the course of the second, third, fourth, or fifth day. Irritation of the alimentary canal, the first symptoms of poisoning, had been clearly induced, and as manifestly allayed, almost instantly, by the antidote. Professor Orfila has related many satisfactory experiments in proof of the virtues of albumen in destroying the corrosive qualities of bichloride of mercury, and converting it into the comparatively harmless albuminous protochloride. Peschier considered that the white of an egg is sufficient to render four grains of the poison innocuous. Dr. Christison also remarks, that the prompt exhibition of albumen, just as the symptoms of uneasiness appear, prevents further ill consequences.

With regard to the salts of copper, Orfila found that albumen is also the surest antidote to their poisonous qualities, and his experiments have induced him to recommend that substance in preference to any other. He found that when 25 or 36 grains of verdigris were mixed with the whites of six eggs, the poison which, if pure, and administered alone, would have caused death in three hours, did not produce it for seven days; and had no effect whatever for five days, also in some experiments the œsophagus was tied to prevent its expulsion.

ON CROTON OIL IN NERVOUS DISORDERS.*

BY JOHN COCHRANE, ESQ.

In the second number of the *Edinburgh Monthly Journal of Medical Science*, p. 128, I observe a few remarks in reference to the efficacy of croton oil, as employed by Sir C. Bell, Drs. Newbigging and Janelli, in certain nervous disorders. It is my favourite remedy in affections of this description, and my experience of its peculiar efficacy is of several years' duration. In epileptic disorders, I have, I may say, invariably found it highly satisfactory to myself, and of the greatest advantage to the patient, by its speed in subduing the violence of the fits, and inducing a calm and tranquil condition. In confirmation of what I thus state, I subjoin three cases.

Some time ago, I was called to attend a patient aged about 30, of a strong and robust constitution. When I first saw him, he was outrageous, and could not easily be managed by four strong individuals. His gestures, deportment, and violence were such as would have induced many practitioners to have had recourse at once to the strait jacket, but to me they occasioned little alarm, as I knew well the certainty of my remedial agent speedily producing an effect, at once useful to the patient, and gratifying to those around him. I prescribed as follows:—

℞. Ol. Tiglii gtt. x.
Muc. G. Arab.
Syr. Simp. ā ā ℥i. Misce.

Sign. Give a teaspoonful every ten minutes till he becomes calm.

Half an hour had scarcely passed when he became quiet, and at the end of an hour he had so far recovered as to be able to sit up in bed, and give rational replies to every question; whereas, before he got the medicine, he could scarcely articulate one word distinctly. Under the use of the above remedy, this individual ultimately so far recovered as to be able to follow his usual employment as a housepainter.

In December, 1839, I was called to attend a female patient, whom I found in bed, completely prostrate, and apparently insensible to all around her. In fact she was completely comatose; her pupils were greatly contracted, her pulse could scarcely be felt, and, in fine, she seemed all but sunk into the sleep of death. The remedy which I employed in this case was the croton oil, in combination with mucilage and castor oil, thus proportioned:—

℞. Ol. Tiglii, gtt. viiij.
Ol. Ricini, ℥iij.
Mucil. G. Arab. ℥j. Misce bene.

Sign. Enema. To be administered in a quart of gruel.

Though I employed the above potent remedy, I must say, I scarcely expected any good to result from it; but, to my great joy and satisfaction, it had a most beneficial effect upon the patient, not by producing an alvine torrent, but by occasioning a very copious discharge from the bowels *per anum*, as well as from the stomach, by vomiting, together with a return of sensation and motion, and the use of her mental faculties. Indeed, the effect of the medicine was truly astonishing, for when

* *Edinburgh Monthly Journal of Medical Science*, No. VII. July, 1841.

I left her, she seemed all but dead. On my second visit, only a few hours afterwards, she was able to sit up in bed, and converse with those around her.

The following case I deem of great importance in regard to the effects of croton oil. It did not occur in my own practice, but in that of a gentleman in whose testimony I can place the utmost confidence. About two years ago he was called to see a Mrs. E., who had been ill for about a fortnight. Her disease appeared to depend entirely upon obstinate constipation; to remove which, the medical gentleman who had been previously in attendance upon her, had used a great variety of powerful purgatives, which failed to produce the desired effect. My friend was at this time in the habit of prescribing croton oil very freely; and, considering this a good case for its exhibition, he ordered her to take eight drops, which, though a large dose to commence with, proved ineffectual. After a few hours, he repeated the medicine in small doses, till the patient had taken in all fifteen drops, within twelve hours, when the bowels were freely opened. The purging which followed gave immediate relief, and Mrs. E. rapidly recovered, without suffering any injury from the large quantity which she had taken of this powerful oil.

PROCESS FOR DETECTING COPPER IN MEDICO-LEGAL ANALYSES.*

BY M. VERGUIN.

This process was suggested to me by a fact which I observed some years ago, when analysing a copper ore. I had, by chance, put my solution into a platinum capsule, and wishing to obtain the copper in the metallic state, I steeped in it a sheet of iron. So long as the iron was not in contact with the platinum no phenomenon was produced; but the moment they touched, the capsule was covered with a very adhesive layer of copper, and the precipitation was no longer made on the iron: the adhesion was so strong that I was obliged to have recourse to nitric acid to remove it. I did not pay much attention to this fact, and I had almost forgotten it, when it was recalled to my mind, in reading Dr. Christison's process for the determination of mercury, and I sought for a simple process which might be applied to the detection of copper in medico-legal analyses.

Before entering into a description of my process, I may briefly examine the various reagents employed, their degrees of accuracy, and the cases in which they are insufficient. These reagents are ammonia, ferrocyanuret of potassa, and metallic iron.

* *Journal de Pharmacie, June* 1841.

Ammonia acts by dissolving the oxide of copper, acquiring a fine blue colour. This coloration may be with difficulty perceived: 1st, if the tested liquor contain a salt whose base is precipitable by that reagent, for then the precipitate masks it; 2d, if it be colored by an organic substance. Indeed, it may be filtered and decolored with animal charcoal, but when we have but a small quantity of substance to operate on, and when it is of very great importance, the manipulations ought not to be multiplied.

Prussiate of potassa detects small quantities of copper; but the liquor must be pure, and particularly free from iron, for it is impossible to distinguish the brown colour of the salt of copper mixed with the blue colour of the salt of iron.

Iron acts, by decomposing the salt of copper, and precipitating the copper in the metallic state, as represented by the following formula:—

$$(Cu\ddot{S}) + Fe = Cu + Fe\ddot{S}$$

in which it is seen that the iron takes the place of the copper, and that, after the operation, we have sulphate of iron and metallic copper. But the liquor requires to be slightly acidulated; but if too much be added, and if the copper is found in small quantity, the iron turns black, and thus prevents the copper from being easily distinguished. Besides, the copper does not adhere to it, and the slightest touch removes it.

These objections do not exist in the process which I am about to describe, and which is only the application of the fact already mentioned.

If the liquid to be examined be dilute, it must be concentrated, then slightly acidulated with hydrochloric acid; a drop must be placed on a sheet of platinum, which must be covered with a well cleaned sheet of iron, so that the iron may touch both the liquid and the platinum; in a few seconds the platinum presents a very adhesive layer of copper on the part occupied by the liquid.

The explanation of this fact rests solely on the electro-chemical theory: it is founded on certain principles which I will briefly enumerate:—

1st, When two metals are put in contact, electricity is produced, one of the metals is positively, and the other negatively, electrified.

2d, If a solution is submitted to the action of the pile the salt is decomposed, the acid goes to the positive, and the base to the negative pole: there are salts which are not only decomposed into acid base, but the base itself is decomposed into metal and oxygen: in this case, the metal goes to the negative pole, and the oxygen, with the acid, to the positive.

Now, if iron and platinum be put in contact there is a development of electricity, which is rendered still more active by the presence of a

saline solution; the iron is positively electrified, and the platinum negatively. The salts of copper possess the property of being decomposed not only into acid and oxide, but the oxide itself is further decomposed into metal and oxygen. Thus the acid and the oxygen go to the iron, which is the positive pole of this pile, and the copper remains on the platinum, which is the negative pole.

This process is very accurate, and does not present the uncertainties of other methods; it is very simple, not requiring any manipulation which cannot be made by every person provided with some chemical knowledge, and I think that it will be very useful in medico-legal investigations.

ON AN ANTIDOTE FOR THE SALTS OF COPPER.*

BY M. BENOIST.

Liquid albumen, which has the property of decomposing and precipitating all the saline solutions of the metals of the four last classes, forming compounds of albumen, metallic oxide and mercury, is now almost exclusively employed as a counter-poison for the salts of copper.

But we labor under a very serious mistake, in a case of poisoning, after having induced and facilitated vomiting, if, gorging the patient with a greater quantity of albumen, we hope thereby more certainly to neutralize the poison: what would happen? the cupreous precipitate would be dissolved in the excess of albumen; if, on the contrary, too small a quantity be employed, it would be dissolved in the too abundant salt of copper.

There are no means of obviating this inconvenience, because we do not yet know what proportion of albumen is capable of neutralizing a given quantity of any cupreous preparation. Again, when it is positively ascertained, the portion left in the stomach after vomiting, never can be known.

I am about to propose another agent which does not present the same objections; I mean dissolved carbonate of soda, which has the property of forming with the cupreous compounds, green precipitates of carbonate of copper, insoluble in water, a species of artificial malachites, such as we prepare in our laboratories, by the double decomposition of sulphate or acetate of copper by the carbonate of soda.

It is on account of its insolubility in water, that this salt has no action on the animal economy. I have tried experiments on animals: to some I have given acetate, to others, sulphate of copper, and to others, the alkaline solution and the poisonous substance at the same time. In all cases, I may say, I have obtained satisfactory results. I administered saturated carbonate of soda to a moderate sized dog, to the amount of 35 grammes. This quantity, although more than sufficient to neutralize the poison swallowed, did not give rise to a single bad symptom: I am of opinion that this salt may with impunity be carried to a very high dose, since in the case of which I speak, it produced only a few alvine evacuations. The great quantity of carbonic acid which it contains, prevents it from possessing the same causticity as the other alkaline carbonates. Hitherto, I have not had an opportunity of applying it to cases of poisoning in man. I may mention that, to prevent loss of life, it is alway indispensable to excite vomiting, in order to expel as much poison as possible.

Let us call to mind the period before M. Orfila had brought the science of toxicology to its present high state of perfection: what means then had physicians of combatting poisonings produced by the preparations of which I speak? Sugared water: and this means having succeeded, how is it explained? It was, doubtless, because the carbon of the sugar procuring from the water and oxide of copper, oxygen sufficient for it to pass to the state of carbonic acid, the same reaction as that treated of in this note was obtained.

We have moreover a recent example of the action of sugar under such circumstances, in a case by M. Lesage relative to a young man who, for some love troubles, had resolved to poison himself, but having by chance taken a very sweet drink before taking the sulphate of copper which he had procured for that purpose, the poison was neutralized.

From the preceding we may conclude that if sugar by one of its elements gives rise to the formation of carbonic acid, which forms insoluble compounds with the salts of copper, we ought not to be astonished that carbonate of soda possesses that property in a higher degree.

Milk has also long been considered as an antidote for the cupreous salts: this acid, it is true, removes much of the caseum which it precipitates, in the same way as vinegar acts in the preparation of whey: but it has never been of any great use in these cases, except as an emollient.*

* *Journal de Chimie Medicale*, July 1841.

* Sulphuretted hydrogen and the alkaline sulphurets, are excellent antidotes for the salts of copper.—Eds. *Journal de Chimie Medicale.*

STRENGTH OF HYDROCYANIC ACID.

To the Editors of The Chemist.

Gentlemen:—

Although I have exceeded the prescribed limits for you to receive communications, yet

as the subject is of importance to the dispenser and the physician, and, above all, as the chemist is awfully responsible, I am sure you will devote a small space in your valuable Journal to exposing our mutilated life or death pharmacopœia.

Two prescriptions have come into my hands this morning; the one ordering six minims of acid. hydrocyanic. med. for a dose, and the other, one minim of acid. hydrocyanicum, each for patients under similar circumstances. Now, supposing that Scheele's strength was employed for the former, and the pharmacopœia article for the latter, the result might prove fatal in the one, and totally inert in the other case: and what means have we of distinguishing which ought to be employed? Does the physician direct us? no, not in nine cases out of ten, does the pharmacopœia distinguish the difference in strength of the various preparations of this important agent! Yet the strength of the one as compared with the other, is about five times.

I am, Gentlemen,
Respectfully yours,
J. F.

Putney, 28th June, 1841.

PRESCRIPTION WRITING.

To the Editors of The Chemist.

GENTLEMEN:—

Conjointly with pharmaceutists in general, I cannot but condemn the indifference with which physicians write their prescriptions, both with regard to accuracy and legibility; nevertheless I regret to find a party reprobating the malpractices of others, who at the same time evinces no less a want of due caution than those whom he censures. Your correspondent, A. Z., admits that many of the prescriptions that have fallen in his way during five-and-twenty years' experience have been *merely* guess work; now this circumstance would appear to me to be equally deserving of censure, as the careless method of writing adopted by physicians. I cannot imagine that the public will be very ready to make distinction between the merits of the individual who writes an illegible hand, or the party who compounds at a guess that which he cannot possibly construe: common honesty would dictate a refusal to prepare that which cannot be correctly and satisfactorily interpreted, setting aside the probable injury attendant upon an improper administration of medicine. Neither can I imagine any good that can be derived from a publication of such statements, but can easily conceive that such a course would tend to create greater distrust in the profession than that which the public is already prone to; it is evident such statements are calculated to increase the existing prejudice against medicine and the faculty generally: under such circumstances the public will be led to think that, what with the negligence of the prescriber and the guessing of the compounder, they may consider themselves fortunate if happily they escape poisoning, and which event is to be attributed more to good luck than management. I am free to give your correspondent credit for showing a little more discretion in adopting the above initials: had he given his name, doubtless he would have found the public not over anxious to show their admiration of his very candid confession.

It is my humble opinion, that in writing the directions for the administration of medicines, the substitution of "plain English" for the "very worst Latin," would be a very beneficial reform; although I dissent from your proposition as far as regards writing the formulæ in English, for the very satisfactory reason assigned by your correspondent. There is little utility in the present system, as in most cases it is accompanied with a verbal direction, and at all times rendered into English by the dispenser; whereby it is attended with risk, from probable misconstruction, owing to the inconsiderate use of contractions, a too great similarity in the termination of words, when so contracted, and the general illegibility of the writing. I will conclude my observations with the very pertinent remarks of Dr. Paris on this subject, together with the following anecdote illustrative of the foregoing statements:—

"It may be proper to impress upon the practitioner the importance of writing his prescriptions in legible characters, and of avoiding all those abbreviations which are not generally understood, or which may be capable of misconstruction."

I will relate an anecdote which is well calculated to illustrate the mischief that may arise from abbreviated prescriptions—"One of our most eminent surgeons, having occasion to direct the application of a lead plaster (Emplast. Lythargyri. P. L. 1787), he abbreviated the term as follows—Emp. Lyth.: in the haste of compounding, the *h*, perhaps carelessly written, was easily mistaken for *t*, and the chemist accordingly sent the Emplast. Lyttæ! As it was applied to the pudenda it is not necessary to state the distress of the patient, and the dismissal of the practitioner, which followed."

I would add, that the plan here intimated is adopted at the present time by some of the most eminent of the faculty, and think it might be generally acted upon, except in a few cases of emergency, where necessity required such abbreviations or idiomatical expressions as are generally understood, and which should in such case be distinctly written.

I am, Gentlemen,
Yours respectfully,
A MEMBER OF THE PHARMACEUTICAL SOCIETY OF GREAT BRITAIN.

St. Marylebone.

CHAUSSIER'S LOZENGES.

℞. Opium..... 6 grains.
Camphor..... 20 do.
Sugar ..... 3 drachms.
Mucilage of gum tragacanth, Q. S.

Make forty-eight lozenges. Dose—five, six, and even more, *per diem*.

PECTORAL LOZENGES.

℞. Opium..... 1½ drachms.
Sugar ..... 2 pounds.
Mucilage of Iceland moss } āā 2 pounds.
Mucilage of gum arabic }

Make lozenges of twenty-four grains. Dose—ten, *per diem*.

POISONING BY OPIUM.*

BY M. TILLOY.

A PORTER, having by degrees collected sixteen grammes of laudanum (equivalent to four grammes of opium), took it with the intention of destroying himself. He was soon attacked by stupor: his sleep became extremely agitated and convulsive. Being called in in a hurry by his wife, and having examined the liquid which the unfortunate man had swallowed, I administered to him a solution of 15 centigrammes of tartar emetic, and a glyster containing a similar quantity of emetic. Half an hour after, as all the symptoms of poisoning seemed to have diminished, I administered 5 centigrammes of emetic, and the improvement was very evident. Next day, the patient was able to resume his work.

POISONING BY STRYCHNINE.†

BY M. TILLOY.

AT the time of year when, as a judicious measure of security, the police poison dogs, one of these animals, of a large size, was a victim to this precaution, and his master perceived it only when the first symptoms occasioned by strychnine manifested themselves. I administered to the dog 20 centigrammes of acetate of morphia; half an hour after, the vomiting had not increased; but as the animal appeared to me to be still under the influence of strychnine, I continued the use of the acetate of morphia, to the dose of one decigramme. He soon recovered, and six or eight hours after, he seemed to have nothing the matter with him.

Although the morphine had neutralised the effect of the strychnine, I thought that it was not the specific remedy, and I tried the effect of laurel water. Indeed, having administered to a small dog, 5 centigrammes of strychnine, I afterwards gave him a spoonful of laurel water; the animal vomited and was not ill. Next day, I renewed the experiment on him, and I awaited the effect of the poison, that is to say, the complete developement of the tetanic symptoms; I then administered to him a spoonful of laurel water, which he instantly threw up; a fresh dose was administered without being rejected this time, but the convulsive movements, although less violent, had not disappeared; they did not completely yield until the third dose of the laurel water, and the animal soon after recovered his natural vivacity.

* *Journal de Chimie Medicale*, July 1841.
† *Idem*

IODIDE OF ARSENIC.

IN answer to a correspondent, we give the following from Pereira's *Materia Medica*:—

"This compound is prepared by gently heating in a tubulated retort placed in a sand-bath, a mixture of one part finely pulverized metallic arsenicum, and three parts of iodine. The iodide is afterwards to be sublimed, to separate the excess of arsenicum. The compound thus obtained is an orange-red solid volatile, and soluble in water. If the solution be rapidly evaporated to dryness, we reprocure the iodide; but if we concentrate, and then place the solution aside, white pearly plates are obtained, which, by Plisson are regarded as a periodide of arsenicum, but by Serullas as oxide and iodide of arsenicum (Souberain, Nouv. Traité de Pharm. ii. 613; and Serullas, Journ. de Chim. Med. iii. 601). Iodide of arsenicum is probably composed of 1½ eq. iodine = 137·5, and 1 eq. arsenicum = 38. It has been employed by Biét in the form of ointment (composed of iodide of arsenicum, gr. iij, lard ℥j.), as an application to corroding tubercular skin diseases (Magendie Formulaire)".

ROYAL ORLEANS VINEGAR.

ALTHOUGH, in pursuance of the objects of this journal, it is part of our duty to detect and expose all frauds and adulterations in the commodities of life, it is equally our duty to bring into notice and public estimation, all such articles as are pure in their composition, and distinguished for the perfection of their characteristic qualities.

Among the numerous articles which are subject to various frauds and adulterations, vinegar is one which undergoes every degree of manipulation, by some makers, while, by others, it is manufactured with the greatest care and attention to purity.

In consequence of our attention being called by an anonymous circular, signed "A Chemical Analyser," evidently designed to injure the character of a new kind of vinegar, known by the name of "ROYAL ORLEANS VINEGAR," we deemed ourselves bound to procure a sample, which, after repeated and the most careful and accurate analysis, was found to be

perfectly free from all admixture of extraneous matter, at the same time possessing a flavor so grateful as to give it a very decided preference over the common sort.

It may not, perhaps, be generally known, that by law, vinegar is allowed to contain in a thousand parts, one part of sulphuric acid; in this sample, however, only a very slight trace of it could be discovered, and no deteriorating ingredient, while samples of the common London vinegar which were procured and analysed at the same time, were found to abound with sulphuric acid and other substances, and were thick and unpalatable. We can therefore, without hesitation, affirm that they bear no comparison with the Royal Orleans Vinegar, either as regards purity of composition or delicacy of flavor.

We cannot conclude these observations without expressing our regret and disgust at seeing science prostituted by being made the vehicle for the gratification of malignity and the infliction of private injury, which manifestly are the objects of the composition circulated by "A Chemical Analyser," whose style of composition is as deficient as his orthography; and whose remarks, as relates to science, are a libel on the name, and are such as to evince him to be of the lowest grade of tyros and pretenders. One who accuses others of want of education, ought to possess a far greater portion than does "A Chemical Analyser" exhibit in his circular, when he talks of "foreign ingredients" instead of "foreign articles," for surely he does not mean to call *Bohea tea* an ingredient. His observation that these deleterious "sours may be further concentrated by distillation over the vapor of water," (steam we suppose he means), is perfect nonsense: it were idle, however, to attempt further exposure of folly that carries with it its own refutation. It is sufficient to say, the process, a description of which is attempted in this circular, is a very elegant and effective one, and that the vinegar thus prepared will rapidly come into universal consumption, and take the lead of all others. In conclusion, we would advise "A Chemical Analyser" in future to confine himself to facts; and when next he advocates the cause of "good morals," to recollect that it is inconsistent and absurd to do so at a time when he is setting truth and justice at defiance, and dragging in science only to degrade it.

To the Editors of The Chemist.

Ashford, July 14, 1841.

GENTLEMEN:—

Perhaps you will allow the insertion of the following Queries; they may tend to elicit some useful information, and lead to some profitable discussion.

Should you be pleased to admit these, I hope to furnish you with something more worthy a niche in your invaluable periodical, next time.

---

1. What is the form for preparing the solution of gelatine, mentioned at page 126 of your first Volume?

2. In what manner is that article now so extensively used by druggists; I mean the Cret. Præcip., made?

3. Has any person ever discovered a varnish that will effectually resist the action of spirits and oils to cover the gold labels on druggist's bottles? If any one is in possession of such a secret, he would be conferring a lasting obligation on the greater portion of your readers, by communicating it.

4. Query the preparation of Magnes. Carb. *ponderos*; and Magnes. Calc. *ponderos.*

5. What constitutes a patent medicine? that is to say, when are medicines liable to a stamp duty? We see many druggists of the present day offering their "antibilious pills," &c., for sale without a stamp, while others are scrupulously careful in attaching one. Are the parties neglecting so to do liable to a fine?

6. Is there any thing that will remove the disagreeable smell from sperm oil, and leave it perfectly inodorous?

7. Why is the Inf. Aurant. co. P. L. Nov. only ordered to stand fifteen minutes, while the same ingredients in the Inf. Gent, co. and Inf. Caryoph. are allowed *one* and *two* hours?

I am, Gentlemen,
Yours respectfully,
JOHN FORDRED.

TO CORRESPONDENTS.

A CONTINUAL READER.—Indigo is distinguished from Prussian blue by rubbing with the finger-nail: the former thus acquires, and the latter is deprived of, a coppery hue. Tables of affinity, &c. are to be met with in most chemical works, especially Ure's Dictionary.

JUVENIS is informed that water is not generated by the atmosphere. We recommend him to read some work for information: to give him what he requires to know, would occupy too much of our space.

NOTA BENE.—*All Communications and Books for Review must be addressed, "To the Editors of The Chemist, care of Mr. Hastings, Publisher, 13, Carey-street, Lincoln's Inn Fields, London." Communications must be pre-paid, and sent before the 15th of each month; Books for Review, before the 10th.*

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Models and drawings of the proposed railway may be seen and examined, and prospectuses containing every requisite information, obtained at the Company's Offices, 1, Walbrook-buildings, Walbrook, London, where application for shares may be made.

London, May, 1841.

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THE CHEMIST.

I. CHEMISTRY.

BRITISH ASSOCIATION. ELEVENTH MEETING.

SECTION B.—CHEMISTRY AND MINERALOGY.*

President,—DR. DAUBENY.—Vice Presidents—Prof. DANIELS, and Col. YORK.

THURSDAY, JULY 29.

COLONEL YORK took the Chair, in the absence of the President.

THE following are brief but faithful abstracts of the papers read at this meeting of the section.

I.

'ON the Influence of the Ferro-Cyanate of Potash on the Iodide of Silver, producing a highly sensitive Photographic Preparation.' By Mr. R. HUNT.

Being engaged in experiments on that kind of photographic drawing which is formed by the action of the hydriodic salts on darkened chloride of silver, with a view to the removal of the iodide, formed by the process, from the paper, Mr. Hunt was led to observe some peculiar changes produced by the combined influences of light and the ferro-cyanate of potash. He discovered that ordinary photographic paper, if allowed to darken in sunshine, and then slightly acted on by any hydriodic salt, and washed, when dry, with a solution of ferro-cyanate of potash, became very sensitive of light, being changed from a light brown to a full black, by a moment's exposure to sunshine.

Following out this result, he found that perfectly pure iodide of silver was acted on with even greater rapidity, and it thus became easy to form an exquisitely sensitive photographic paper.

The method recommended is as following:—

Highly glazed letter paper is washed over with a solution of one drachm of nitrate of silver to an ounce of distilled water; it is quickly dried, and a second time washed with the same solution. It is then placed for a minute in a solution of one drachm of the hydriodate of potassa in six ounces of water: and, being placed on a smooth board, gently washed by allowing pure water to flow over it: it is dried in the dark, at common temperatures. Papers thus prepared may be kept for any length of time, and are at any moment rendered far more sensitive than any known photographic preparation, except the Calotype, to which it is quite equal, by simply washing it over with a solution formed of one drachm of the ferro-cyanate of potash to an ounce of water. These papers may be washed with the ferro-cyanate, and dried in the dark: in this dry state they are absolutely insensible, but they may at any moment be rendered sensitive by merely washing with cold water. The paper is rendered quite insensible by being washed over with the above solution, and from the photograph thus fixed, many copies may be taken.

Mr. Hunt then proceeded to describe the action of the spectrum on this preparation, and stated that the greatest effect was produced by the least refrangible rays; but that all the rays, excepting the extreme red, acted with energy. The impressed spectrum was, in all cases, distinctly coloured from end to end; and it was found that the colours of superposed media left a corresponding tint upon the paper, but, unfortunately, as the paper dried, the colours faded. These results bring nearer the probability of eventually being enabled to produce photographic pictures in their

* In our next Number, when we have laid before our readers the remainder of the report of the meeting of this Section, we shall make a few observations on the British Association, and on the extent to which science has benefitted by the eleventh meeting. EDS. CHEM.

native colours. All the spectra formed on these papers were surrounded by a marked space, which was protected from the influence of the dispersed light, exhibiting another proof of the fact before noticed by Sir John Herschel and the author, that a class of rays having peculiar negative properties emanate from the edges of the sun.

Spectra and numerous specimens of these drawings were exhibited.

II.

"Some Researches on the Development of the Electrical Force, and an Inquiry into the Natural Properties of the New Element or Product of Electrical Action, mentioned by Schönbein." By F. De Moleyn, Esq., M.A.

Mr. De Moleyn, commenced by remarking, —"That we are on the eve of some extraordinary discoveries in electro-chemical science, which will most probably effect an entire change in the views of chemical relations at present entertained, there can scarcely exist a doubt. The doctrine of substitutions of Dumas—the strong proofs of the identity of silicon and carbon—the fact of the capability of the same body to crystallise in forms belonging to two different systems—the observations of Schönbein, which formed the groundwork of the first part of the subject of the present paper, with various other singular results recently obtained by eminent philosophers, fully sanctioned this opinion. The interesting character of the facts newly brought to light, and the confessed inadequacy of the various theories presented to the world since the commencement of the present century, to explain or reconcile these modern results of laborious investigation, furnished good ground for fresh inquiry, and encouraged new labourers to enter the field of science."

Mr. De M. then proceeded to say, that Professor Schönbein's statement at the Glasgow Meeting, relative to the production of a new element which he called *ozone*, had attracted his attention, from his having, in the course of his electrical experiments, been struck by the peculiarity of the odour which the power of the batteries he employed, produced to such a degree as to determine him, if possible, to solve the mystery.

The present paper contained some of the more important results which he had obtained.

In the report above alluded to, Professor Schönbein stated that the disengagement of the "odorous substance" depended:—

1st. On the nature of the positive electrodes:

2d. On the chemical constitution of the electrolytic fluid:

3d. On the temperature of that fluid.

Mr. De M. added, that his experiments went to shew, that well-cleaned gold and platina were *alone* capable of disengaging the odoriferous principle, and that the more easily oxidable metals, as well as charcoal, did not possess that property at all. The results of Mr. De M's. investigation proved:—

1st. That the disengagement of the peculiar odor was not confined to the less easily oxidable metals:

2d. That, by certain arrangements, all metals, when positive electrodes, may be made to develope the odoriferous principle:

3d. That certain positive metals, not acting as electrodes, evolve this principle:

4th. That charcoal is not an exception to this rule:

5th. That all substances, whether of crystalline structure, or otherwise, possessing the property of appearing luminous by friction, or of yielding sparks when struck, also possess the property of developing, under such circumstances, the "peculiar odor:"

6th. That iron and nickle develope this principle much more strongly than any other metal:

It was easy to account for Schönbein's error in stating that gold and platina only developed the odor, for he applied but one mode of evolving the principle, namely—by using the substances on which he experimented, as positive electrodes in electrolytic fluids; it was therefore clear, that if, as he stated, even gold and platina only produced the odor when clean, it must have been next to an impossibility for him to have evolved it from metals with more easily oxidable surfaces, and therefore in a condition to conceal rather than develope so subtle an element. There could exist no doubt of its evolution from *all* the metals employed by the Professor; but there was a little doubt, that immediately on its disengagement, combination ensued with the particles of the film enveloping the ill-cleaned surfaces of the inferior metals, and thus that all evidence of its existence vanished.

Mr. De Moleyn taking into consideration the possibility of such an obstruction to the disengagement of the odor, contrived an apparatus by which friction might be applied to the surface of the positive electrode, and in every case he found that the odor was evolved more or less strongly.

Schönbein's opinion—that ozone was the electro-negative element of an electrolytic compound existing not only in aqueous fluids, but also in the atmosphere—made it a point of much importance to ascertain whether it could be produced in dry air or *in vacuo*. The Professor himself had remarked that "problems of the highest scientific importance would be raised, in case it should appear that ozone could be produced in dry air."

Mr. De Moleyn accordingly devised different experiments for the purpose of determining that interesting question, some of which he described in his paper. He stated, that ob-

serving the odor to be produced at the points connecting an electro-magnetic machine with the battery, he constructed an apparatus by which magnets were made to revolve within a glass cylinder, which could be exhausted or filled with various gases, at pleasure; by this means he obtained a vacuum, and operated in dry air, collecting the matters evolved over distilled water, and by such modes he clearly proved that ozone could not only be produced in a dry atmosphere, but also in mercurial and common vacua.

In several instances where distilled water had been admitted into the exhausted tube containing the odor, there was a much larger portion of the tube unoccupied by the water than calculation gave as the maximum space for the residual air after exhaustion; thus proving that ozone had been concentrated, or reduced to a substantial condition. On opening the tube, the odor was scarcely bearable, and diffused itself quickly, causing the same sulphureous smell as that prevailing in a place struck by lightning.

These experiments, varied and frequently repeated with similar result, led Mr. De M. to the conclusion, which he hoped would also be entertained by the Section, that Schönbein's ozone—which, for good reasons which formed the subject of a future paper, he proposed to call Electrogen—must be admitted into the list of supposed elements; that it was not, as developed by Schönbein and himself, an union of an electrolytic compound whose nature was unknown; and that probably it existed in combination in various forms of matter, which at present are considered, but which, in reality, are not elementary.

Mr. De Moleyn added, that he was still prosecuting these experiments, and hoped shortly to add considerably to the proofs already adduced. He was quite sure that the results already obtained would be followed, when in abler hands than his, by a succession of brilliant discoveries, proving the opinion at present entertained concerning elementary substances to be sadly at variance with that beautiful simplicity which throughout the universe formed, and still forms, the groundwork of the operations of the great Author of our existence.

Professor Daubeny remarked, that Mr. De Moleyn's communication was of great importance. It appeared to him that the next step to take, would be that of investigating the chemical action of the principle, and he would suggest to Mr. De Moleyn to direct his future inquiries to its combinations with different substances.

Mr. De Moleyn next gave notice of the discovery of a voltaic combination of extraordinary energy. To this combination he had given the designation of the *Calorific Sustaining Battery*, from its amazing calorimotive powers. He stated, that the energy of the combination was such, that with three pairs of metals, exposing no more than six square inches of surface, the battery will liberate five cubic inches of mixed gases per minute; heat to a bright red, six inches of platinum wire, 1-50th of an inch in diameter; and charge electro-magnets proportionally. Mr. De M. added, that the combinations were such that there was no counteraction, so that he had the sum of the affinities instead of their difference. There was also the additional advantage that there were no unpleasant fumes, and that the battery could be made to sustain its power for any period required.

Mr. De Moleyn's papers were received with much satisfaction by the Section.

Friday, July 30.

I.

"On some Instances of Restrained Chemical Action." By E. A. Parnell.

The object of this paper was to add to the list of circumstances which modify or impede the action of chemical affinity, in a force exerted by the presence of water in the sphere of decomposition, producing a force of considerable power, and one whose action has not hitherto been recognised. Its existence has been discovered by observing the want of action of certain gases, and especially sulphuretted hydrogen, when in a perfectly dry state, on substances on which they exert a powerful action in the presence of water. Thus, papers impregnated with salts of lead, mercury, and copper, were protected from the action of sulphuretted hydrogen, if rendered absolutely dry. That the effect of water in permitting action between these same bodies, does not wholly depend on diminution of the force of cohesion, by dissolving either the gas or the salt, is proved by several circumstances:—

1st. This want of action is perceived only with respect to particular salts:

2d. To restore the action, water may be present in a state of combination with the salt, and then can exert no solvent power:

3d. On moistening various dry salts with absolute alcohol, which dissolves six times its volume of sulphuretted hydrogen, and exposing to the gas, still no action ensued.

Considering the nature of the salts on which the action of sulphuretted hydrogen is restrained, it would seem that the function of water in permitting action, is to combine with the acid, which should be rendered free by sulphuretted hydrogen, immediately on its liberation. One equivalent of water is not always sufficient to satisfy the acid, for all anhydrous salts of the oxides of mercury, copper, or lead, can produce one equivalent of water with sulphuretted hydrogen. The action of water may in some measure be compared with that between sulphuric acid of different degrees of strength and metallic iron or zinc,

These metals, as is well known, undergo no change in sulphuric acid, while in this case, as well as when dry sulphate of lead is exposed to dry sulphuretted hydrogen, it would be said all is necessary to produce decomposition. But in both cases water must be added for action to be set up; in the one to unite with the sulphate of zinc about to be formed, and in the other with the sulphuric acid.

But there are some salts of those metals which are not acted on by sulphuretted hydrogen when dry, whose acid or hydracid of its salt-radical possesses but little affinity for water, and to which, consequently, this explanation will not apply. In considering the cause of the want of action here, it must be remembered that in reality sulphur is a weak radical; that if the salt be soluble, a force is called into action when its solution is acted on by sulphuretted hydrogen, which possesses great power over the results of chemical action, namely, insolubility of the sulphuret; and water being present with which the acid can unite when free, it does not follow that decomposition must occur in one case because it does in another under the influence of different forces.

The author concluded by suggesting an explanation of the singular action between potash and carbonate of lime, in presence of a small quantity of water, observed by Professor Liebig,—carbonate of potash and caustic lime being formed. Both caustic potash and carbonate of potash have a strong affinity for water, but of the two, caustic potash the greater; here is sufficient water to supply the demands of the carbonate, but not of caustic potash; the consequence is, carbonate of potash and caustic lime are formed.

II.

"On some Subjects connected with the Sulphocyanides." By E. A. Parnell.

The author referred to a former paper, in which he showed that the substance supposed to be the isolated radical of the sulphocyanides (obtained by the action of chlorine or nitric acid on sulphocyanide of potassium), contained hydrogen as an essential constituent, and could not therefore be regarded as that radical. The present communication consisted:—

1st. In an investigation of the evidence on which this body acquired its character as the radical:

2d. An examination of other reputed sources of this substance:

3d. Of the action of iodine on sulphocyanide of potassium:

4th. Theoretical considerations on the constitution of the sulphocyanides.

Should Mr. Parnell's views as to the constitution of sulphocyanogen, prove correct, it must be viewed as a hexabasic radical, in whose salts each atom of the base must always be of the same name.

III.

"On Manures, considered as Stimulants to Vegetation." By Dr. Daubeny.

In this paper, the author discussed the question as to the sense in which manures may be regarded in the light of stimulants to plants. It is evident that if the term stimulus be understood in an acceptation similar to that in which it is employed with reference to the animal economy, it ought to be confined to bodies which by their presence assist in promoting the secretion and assimilation of the nutritious matters present, and ought not to include such as themselves afford matter for the plant to feed upon. Thus common salt and other condiments are accounted stimulants to digestion, because, without being nutritious themselves, they, by their presence, cause the food to be more readily assimilated.

Now, it becomes a fit subject for inquiry, whether manures operate in the former way or in the latter, and likewise whether the fact that some of them act less beneficially at subsequent periods of their application than they do at first, is to be explained on the recognised principle "that stimuli lose their full effect upon living matter on repetition."

Dr. Daubeny adduced several facts which led him to infer that the nitrates of soda and of potassa operate favourably on certain crops, by communicating to them *nitrogen*; and that the reason why these salts sometimes appear to lose their influence when repeated, and even to leave the land in a worse condition than before, is not from their being stimuli, and, as such, amenable to the law above alluded to, but because the free supply of nitrogen, afforded by the decomposition of the nitrates, would cause the plant to absorb a larger portion of those other ingredients, such as phosphate of lime, silicate of potassa, &c., which are present in only a limited quantity in the soil: thus tending to exhaust it of these materials, and causing thereby a worse crop to take place the following year. Now, though it may be true that the nitrates, considered in the above point of view, in some sense act indirectly as stimuli, it was conceived that the term itself had best be abandoned, as its adoption might lead to an erroneous impression in the mind of the farmer with respect to the proper mode of restoring to the land its original fertility. If the theory suggested by the author be the true one, it follows that the proper remedy would be, not to discontinue the use of the nitrates, but to restore to the land, by the application of bone manure, &c., at intermediate periods, those other ingredients which had been abstracted from it too largely.

In order to determine what materials are wanting, and in what proportions to apply them, independently of the empirical plan of ascertaining by repeated trials the substances

which best succeed in remedying the deficiency, two methods suggest themselves. The first, a very difficult one, is to learn, by a minute analysis of the soil, whether all the ingredients which the crop requires are actually present in it, so as to take care that they should possess qualities equivalent to those which would be contained in the intended crop. The second, a more practical one, is to calculate how much of each substance had been abstracted by every crop taken off the ground, and to add an equivalent quality in the shape of manure.

Daubeny suggested that a kind of book-keeping on this principle should be undertaken on each farming establishment, in which a debtor and creditor account might be made out, of the nitrogen, the earthy phosphates, the alkali, &c., abstracted as crop, and restored as manure each year; and concluded by directing attention to certain points which require further investigation with reference to this part of the subject. The first of these is, whether nitrates, when introduced as manure, really diminish in quantity and finally disappear after successive crops have been grown upon land impregnated with them. The second is, whether common salt acts as food or as a stimulant to vegetables. The third is, the exact composition of all the several crops cultivated by the farmer, as well as of all the manures he employs, so that he may know exactly the amount of alkaline and earthy salts, as well as of nitrogen, present in each.

The desultory conversation which ensued embraced questions and answers, theoretical and practical, highly interesting and important, inasmuch as the facts elicited thereby may be hereafter applied to the improvement of agriculture. The general impression appeared to be that great advantages may be derived from satisfactory analyses, on a large scale, of soils. These were recommended to be made extensively.

With reference to the use of the nitrates as manures, the principal object to be ascertained is whether or not the nitric acid be decomposed.

IV.

"On the direct formation of Cyanogen, from its Elements." By Mr. G. Fownes.

After referring to the experiments of Desfosses, which tended to show that gaseous nitrogen brought into contact with charcoal at a high temperature, an alkali being present, is absorbed in notable quantity, and a corresponding amount of cyanide produced; and also to the new process of manufacturing Prussian blue, by Mr. Lewis Thompson, (see *The Chemist*, Vol. I., page 20,) in which nitrogen is derived from the atmosphere—the author proceeded to show that the existence of nitrogen in a solid state, in many varieties of charcoal, and the possible presence of ammonia in the nitrogen gas employed, were sources of error against which it was necessary to guard. The author uniformly found, that whenever wood, charcoal, or coke, is ignited in a close crucible with carbonate of potash, at a moderate red heat, abundance of cyanide is always produced, which is never the case with pure charcoal, provided the temperature does not exceed redness. After a few preliminary trials, a mixture of fifty grains of pure sugar charcoal, and fifty grains of carbonate of potash, obtained by gently igniting pure bicarbonate, was placed in a porcelain tube fixed across a furnace and maintained at a full red heat, while pure nitrogen gas, very carefully prepared by acting on a solution of ammonia by chlorine, was slowly passed over the mixture. At the further extremity of the porcelain tube, a small gas-delivering tube was arranged, dipping into a vessel containing water.

At the commencement, the quantity of gas emitted by the exit end of the arrangement greatly exceeded that passed into the tube:—it had no odor, did not render lime-water turbid, and burned with a bright blue flame, generating carbonic acid. After some time the carbonic oxide diminished in quantity, until at length nitrogen alone escaped. The tube, when cold, being examined, was found to contain a black porous mass, which hissed and became very hot on the addition of water. A little of the filtered solution gave, by "Scheele's Test," abundance of Prussian blue; another small portion, acidulated with nitric acid, gave a copious white precipitate with nitrate of silver, and the residue distilled with dilute sulphuric acid (the addition of which scarcely occasioned effervescence) afforded about half an ounce of tolerably strong hydrocyanic acid.

Arrangements were made for repeating the experiment, employing the nitrogen of the atmosphere instead of that artificially prepared, the result of which was, as before, a black mass, rich in cyanide of potassium. The amount of carbonate of potash converted into cyanide by direct absorption of nitrogen, appears to depend very much on the temperature employed. In two trials at a full red heat, the quantity of carbonate converted amounted to 11·5 and 12·5 per cent. of that employed. When, however, the temperature was raised to whiteness, much above the melting point of copper, the production of cyanide appeared much greater. When carbonate of soda was substituted for the potash salt, cyamide was generated, but it seemed with much greater difficulty. The fact, therefore, appeared to Mr. Fownes to be established, that free nitrogen can at a high temperature combine directly with carbon, provided some metal, or similar body, be present whose cyanide is permanent under such circumstances.

The President made a few observations on the illustration which the facts mentioned

by Mr. Fownes afforded of the process by which nitrogen entered into combination with carbon in manure, and also on the probable formation of ammonia in the earth under high pressure.

MONDAY, AUGUST 2.

I.

"A Practical Method of determining the quantity of real Indigo, in the Indigo of Commerce." By Dr. Samuel L. Dana, of Lowell, U.S.

Dr. Dana directs that 10 grains of indigo, reduced to an impalpable powder, should be boiled in a Florence flask for a few minutes, in 2½ oz. of a solution of carbonate of soda, making 30° to 35° by Twaddel's hydrometer, then add 8 grains of crystals of muriate of tin, and boil for half an hour: a beautiful yellow solution of indigo will be obtained. Withdraw the flask from the lamp, and introduce into the solution 500 water-grain measures of a solution of 50 grains of bichromate of potash in 4000 grains of water. The indigo blue, with a trace of indigo red, will be precipitated, while the other components remain in solution. Filter the precipitate through a double weighed filter, washing the mass with 1 oz. of muriatic acid, diluted with 3 oz. of boiling water; wash with hot water till water only returns; separate, dry and weigh the filters; make a note of the weight of the precipitate; burn one filter against the other; the difference is the silica contained in the indigo, which, deducted from the weight of the precipitate, gives the quantity of pure indigo. Mr. W. Crum, who communicated the above, added, that carbonate of soda with protoxide of tin dissolves indigo, and forms a yellow solution, but so slowly, that he doubts if all the ten grains are acted upon. He thinks Dr. Dana must mean soda-ash, which contains a notable quantity of caustic soda; but a much weaker solution of caustic soda would answer the purpose.

II.

"Abstract of a letter from PROF. LIEBIG to DR. PLAYFAIR."

This communication announced the discovery of a white crystalline substance, in large quantity, obtained by M. Schunk from the lichens which are employed in preparing archil (*Lecanora tartarea*, &c.) by extraction with ether. It differs from Erythrine and the compounds described by Dr. Kane, in its insolubility in water. It dissolves readily in alkaline solutions, and is capable of being again precipitated by acids, while the solution is recent; but if kept for some hours, acids produce no precipitates. It has been decomposed, and is converted into carbonic acid, and *Orcine*.

If the substance be dissolved in baryta-water, and the clear solution boiled, a large precipitate of carbonate of baryta occurs, and the filtered solution gives, on evaporation, large quantities of *Orcine*. From this circumstance a number of phenomena in the color of lichens can be explained, which Dr. Kane has detailed in his work on that subject. Prof. Liebig also states that he has performed many experiments on the legumin of beans, and some other leguminous plants. He has come to the conclusion, that this body is identical with the casein in the milk of animals. It has exactly the same composition, and contains the same salts—phosphate of potash, potash, magnesia, lime, and iron—as the casein of milk. He also mentions that Drs. Will and Varrentrapp have devised an excellent method for determining the amount of nitrogen in organic bodies. The substance is mixed with a quantity of caustic potassa, and hydrate of soda, and heated to redness in an ordinary combustion tube. All the nitrogen in the substance escapes as pure ammonia, which is condensed in a small and neat apparatus, containing dilute muriatic acid. This solution is mixed with chloride of platinum, evaporated to dryness in a water-bath, and the excess of chloride of platinum is washed from the ammonio-chloride by a mixture of ether and alcohol. From the metallic platinum which remains after the ammonio-chloride is heated to redness, the quantity of nitrogen is to be calculated.

In conclusion, Professor Liebig states that he has repeated all Dr. Brown's experiments on the production of silicon from paracyanogen, but is not able to confirm one of his results. His experiments prove, that paracyanogen is decomposed by a strong heat, into nitrogen gas, and a residue of charcoal which is exceedingly difficult of combustion.

MR. PARNELL said that he too had repeated the experiments of Dr. Brown, without being enabled to verify any one of his results.

III.

"Some Experiments showing the possibility of Fire, from the use of Hot Water in warming Buildings, and of Explosions in Steam Engine Boilers." By MR. GOLDSWORTHY GURNEY.

From a tubular boiler, driving a high pressure engine, the injection pump was cut off—half an hour after the supply pump was stopped, no water appeared on opening the guage cocks, and the engine was observed to slacken its rate and to move sluggishly—it had dropped from 50 to 30 strokes a minute. The steam pipe from the boiler to the engine was 40 feet in length, and was carried for convenience through the open air, thickly wrapped round with woollen cloth to prevent radiation: soon after the engine became sluggish, the

woollen cloth was observed to char near the boiler, which soon extended along the whole length of pipe; the engine was still working, but with more apparent difficulty, making only 16 strokes per minute; the pressure gauge, which usually ranged between 30 and 40 pounds, now stood at 15, and was gradually sinking. In about five minutes after the woollen cloth had charred, a lead flange, used as a packing at the cylinder joint, melted, and a loud escape of elastic matter followed. The engine stopped working, and a lighted match being brought into the escapage, set it on fire, and it burnt with the lambent flame of hydrogen gas. The author was of opinion, that the escaping vapor was not pure hydrogen. Water condensed on a piece of cold iron held in the flame, but no water condensed on the cold iron after the flame was extinguished. On examining the boiler, all the tubes were found red hot.

This experiment was repeated with numerous modifications. The temperature of the escaping vapour was determined by means of bars, previously prepared to melt at different temperatures; these indicated a temperature of about 400°. In about eight minutes a piece of pure lead melted — woollen cloth was charred, and a piece of tow held in the escapage took fire. In other experiments it was found, that the pipes acquired sufficient heat to explode gunpowder, and many chemical preparations.

Having satisfied himself of this property of heated steam or elastic matter, formed from the last portions of water in a boiler, Mr. Gurney proceeded to examine, as far as possible, its chemical nature — to determine whether any decomposition, or new elementary formation, took place. He found that the elastic matter was not condensible over cold water, and in many cases would not burn, or show any indications of the presence of hydrogen, or other inflammable matter. In some experiments it extinguished flame. The experiments with copper vessels afforded the same results as those with iron.

From these experiments it appeared, that whenever the heating apparatus becomes short of water, the elastic matter formed over the fire will carry sufficient heat through close pipes, to any distance, to set fire to wood and other combustible bodies, whether or not the hot water apparatus be under pressure, or whether the heating surface consist of tubes, plates, or cylinders. On the other hand it would further appear, from some experiments described, that in no case is there danger when a given quantity of water is present. Mr. Gurney suggests, that if both ends of the circulating series in hot water apparatus, namely, the part which immediately goes from the heating surface beyond the furnace, and that part where the circulation returns to it before it enters the furnace, were made of a metal which would not melt at the fair working temperature of the water, but which would melt at a temperature of from 5 to 600° of heat (say lead pipe), there would be little, if any, danger from fire.

It was mentioned that some experiments made many years since, by WOLFE, on some of the boilers of the Cornish steam-engines, corroborated the facts now stated. It was also mentioned by Mr. HUNT, on the authority of Capt. TREGASKIS, that where the boilers had been covered with sawdust, it was found in some instances, and in a very short time, to be charred.

IV.

"On the Disintegration of the Dolomitic Rocks of the Tyrol." By PROF. DAUBENY.

The author attempted to explain, without resorting to volcanic agency, the abrupt form, extraordinary height, naked outline, and fissured surface of the dolomitic rocks of the Tyrol. He attributed the above circumstances to the slowness at which decomposition proceeds in rocks, consisting of pure dolomite, and the strength of the cohesion which binds together the particles of this rock; owing to which, even those portions which stand prominent in consequence of the removal, by the agents of destruction, of their contiguous parts, often remain unaffected by those mechanical forces which would cause the projecting portions of a rock less unyielding in its texture to become detached. The cause therefore of the greater height maintained by the dolomites of the Tyrol, than by the pyroxenic rocks which accompany them, seems to be the slower rate at which decomposition has proceeded in the former, whilst the bold and jagged outline they display, may have been produced by the tenacity with which their parts cohere. The sterile character of these same rocks, even in parts which are not precipitous, appears to be owing to the slowness with which they decompose, as well as perhaps to the absence of organic remains. Professor Daubeny concluded with some suggestions as to the means of fertilizing rocks containing magnesia, where from the slowness of their decomposition they continue sterile; and proposed in such cases to accelerate the disintegration, by pouring upon the subsoil diluted sulphuric acid.

Mr. PRIDEAUX thought that great advantage might be derived in the serpentine district of the Lizard, from spreading over the surface a thin layer of the iron pyrites, which being so abundant in the immediate neighbourhood would be very economical. The decomposition which would ensue would yield sulphuric acid to combine with the magnesia of the rock, and oxide of iron, which is well known to favor vegetation.

A MEMBER feared that the arsenic combined with the pyrites of Cornwall would

render their use, as suggested by Mr. Prideaux, highly detrimental.

Dr. Daubeny stated that Mr. Davies Gilbert had informed him, that water impregnated with arsenic was found to be anything but injurious to the growth of leguminous plants. Dr. D. also said that he had made many experiments—watering plants with water containing arsenious acid, and that certainly it did not appear to him to exert any injurious influence, unless the water was very strongly impregnated with it.

V.

"Some Enquiries into the Causes of the Increased Destructibility of Modern Copper Sheathing. By Mr. Prideaux.

Comparative analysis of five select samples of sheathing, compared with two others by Sir H. Davy and Mr. R. Phillips, three of them having worn remarkably well, and three others having been rapidly destroyed, did not elucidate the cause; some of the purest having suffered the most, whilst neither the nature nor quantities of the alloying metals bore any proportion to the durability of the others; the worst of all and the best but one being nearer alike in composition than any of the rest. The analyses were shown in a table. Neither did the physical properties, as hardness, tenacity, grain in fracture, nor colour, present more consistent relations to the wear. The specific gravity only coincided with the durability, the two most durable being also the heaviest. (The samples were shown.) Hence he had recommended the rolling of the sheathing to be finished cold, both to give it more pressure and to harden it against friction.

Not finding the causes of waste in the chemical or physical qualities of the metal; samples of each, of equal surface, were kept immersed, under parallel conditions, in sea water sharpened with sal ammoniac, and the loss of weight of each ascertained. This did not at all coincide with the waste at sea; the most durable having suffered the most, and the least loss having occurred to one of those which had been most rapidly destroyed. (The proportions were given in a table.)—Hence the cause of waste seemed to be rather in external circumstances, than in the properties of the coppers.

Of these external causes:—

The sheathing usually wasted most about the waterline, and down by the bows and the rudder, where it suffered the wash and froth; plainly from *friction* and *oxidation*.

The bottom was less injured in deep waters; but washed when liable to ground upon black mud, by the sulphureous and other corrosive exhalations. The Eddystone tender appeared to suffer in this way.

The nails appeared to exercise an *electro-chemical* influence, in proportion to the great metallic surface they presented, both to the copper and the salt water. This influence had been very apparent on the Jane, a schooner of Mr. Moore's, on which the copper was quite sound round some of the nails, though the rest of the sheet was perished; whilst round others the copper was much worse than in other parts of the same sheet. All the nails he had tried were electro-negative to the copper; and on immersing equal copper slips from the same sheet, in the same sea-water, in contact with different nails, they had been differently acted on; most of them having lost more, than a slip, to which no nail was affixed; but one having lost less, *that* nail having exercised a protective influence, whilst all the others had been destructive.—(The proportions were shown in a table.)—He recommended that nails should always be made protective, so far as was compatible with their own durability, as the most convenient mode of chemical protection. The *increased velocity* and *activity* of merchant ships, must subject them to increased *wear*, and this activity will expose them more to *stress of weather*, still increasing the waste by *friction*.

It is known that the copper suffers most in *hot climates*, where the vessels are also most subject to *electrical* discharges; heat and electricity being both exciters of chemical action.

The Acorn, which had undergone many heavy thunder-storms on the African coast, had lost 16 per cent. of her copper in 2½ years.

The waters of different seas might contain different proportions of corrosive ingredients. The Plover and Jane had their copper, about the water-line, &c., marked with uniform punctures, as if by organic action. Samples had been obtained from different seas, and tried by the immersion of equal slips of the same copper.

That from the Gulf Stream had wasted the copper much more than the others. (The proportions were shown in a table.)—But after allowing for all these *external causes*, the defect seems, too often, to be in the copper itself. The Eddystone tender and Quarantine cutter both lie most of their time in Catwater; the copper on the former came to patch in three years; the latter is still very good after nine years' wear: a difference too great to be accounted for by the former occasionally touching the mud. The Tartar, frigate, had her copper completely destroyed in four years, without ever leaving Sheerness harbour. But it seemed to little purpose to proceed with comparative analyses, until the different characters of the coppers have been proved, by their wear under *similar* circumstances.

For this purpose he recommended that vessels should be sheathed with different coppers on their two sides, all fastened with the same

nails. Thus the shipwright would learn whose copper he could best confide in, whilst supplying the chemist with materials for ascertaining the causes of the difference in quality. Meanwhile he recommended the nails to be made slightly electropositive to the copper, as a *chemical* preservative; and coal tar laid on hot upon the copper also heated, as a *mechanical* protection against friction.

The Eddystone tender had her water line, &c., fully protected by a mere coat of seal oil; and Mr. Moore's Jane had most strikingly shewn the protective quality of coal tar by the perfect preservation of the lines over which coal tar had trickled, whilst the rest of the sheet was quite destroyed. This specimen was exhibited on the table.

The Jane had been sent to sea with her two sides differently sheathed, and her fore quarters varnished hot with coal tar.

VI.

"New Extemporaneous Process for the Production of Hydrocyanic Acid for Medical Use." By R. D. Thomson, M.D.

The importance of prussic acid as a medicinal agent, has induced Dr. T. to bestow much attention upon its production, so as to obtain it always of uniform strength. Having tried all the processes which have been recommended in this country, for the formation of prussic acid, he was satisfied that none of them afforded an acid of always uniform strength. The process recommended by Dr. Clark, of Aberdeen, was superior to every other, but an objection to his process was the great difficulty of procuring pure cyanide of potassium.

The author believes the following process to be less liable to objection than any at present used:—

The first step consists in forming a pure cyanide of lead. This object may be effected in various ways, either by precipitating acetate of lead by hydrocyanic acid, as prepared from the ferrocyanide of potassium, and sulphuric acid, in a stoppered bottle, or by distilling the mixed materials into a Wolf's bottle, containing a solution of acetate of lead. In either case a definite compound of cyanogen and lead will be obtained, which is to be carefully washed and gently heated. The next step in the process consists in decomposing it, by sulphuric acid.

In order to obtain an acid of the strength of the *Acidum Hydrocyanicum dilutum* of the London Pharmacopœia, that is to say, containing about two per cent. of absolute acid, the following formula is recommended:—

Cyanide of lead ..... 43·36 grains.
Dilute sulphuric acid, L. P., 2 fluid drachms.
Pure distilled water..... 6 do.

Put the cyanide of lead into a stoppered bottle; mix the acid and water in a glass vessel; allow the mixture to cool, and then pour it upon the cyanide of lead. Put in stopper, and shake the fluid and salt together. After standing for some time, pour off the supernatant liquor from the precipitated sulphate of lead, and preserve it in a stoppered bottle.

This formula is based on the circumstance that the dilute sulphuric acid of the London Pharmacopœia contains in each fluid drachm about 9·5 grains of oil of vitriol—

$$(S\,O_3\,H\,O),$$

2 drachms will therefore contain 19 grains of oil of vitriol. The quantity required for saturating 43·36 grains of cyanide of lead is only 17·4 grains, but the small excess is useful in preserving the acid.

LONDON ELECTRICAL SOCIETY.

Tuesday, August 17.

IMPORTANT DISCOVERY.—"ON A VOLTAIC PROCESS FOR ETCHING DAGUERREOTYPE PLATES."

BY W. B. GROVE, ESQ., M.A., F.R.S., PROF. EXP. PHIL. LOND. INST.

Our readers are now well aware of the great success which has continued to attend the application of M. Daguerre's discovery of the action of light upon certain salts of silver. The thoughts of the scientific world have long been directed towards the means of multiplying the pictures obtained; but, until now, without success.

Prof. Grove has been for some weeks past carrying on a series of experiments, which have happily terminated most successfully. At this meeting of the London Electrical Society, he was enabled to exhibit a considerable number of prints from these plates, and also some electrotype copies of the same. The whole art is the pure result of inductive reasoning.

It has been long maintained that in these pictures, the dark parts are silver, and the light mercury. Assuming this to be true, it occurred to Mr. Grove, that if some electrolyte could be discovered, with an anion active, when free, on one metal and not on the other, an etching might be obtained. In this he was not successful; for the elements active on silver were also active on mercury. He then sought a compound involving an element *more* active on one than on the other. This, after many experiments, was found to be present in dilute hydrochloric acid. When this is electrolysed for a few seconds, with a platinized platinum cathode, and a Daguerréotyped picture for an anode, the latter is delicately and perfectly etched.

The etching is so fine that the lines (copies from the well-known faithful picture) are even too fine to receive the molecules of the

printer's ink; and hence it is absolutely necessary to continue the process at the expense of what would else be microscopic truth.

The prints thus obtained are very good; they seem to be more distinct than the originals; for the vision is not disturbed by the reflected light. The author, at the conclusion of his communication, says, that now "instead of a plate being inscribed as 'drawn by Landseer and engraved by Cousins,' it would be 'drawn by Light and engraved by Electricity.'"

Besides this paper, were read several others of considerable interest. Mr. B. Hill, "*On a new Electro-Magnetic Machine.*" In this machine the *sum* of two powers is obtained instead of the *differences*, as in other instances.

"*Description of a smaller Atmospheric Electrical Apparatus.*" W. H. Weekes, Esq. A paper replete with the results of long experience.

"*Further Observations on Electrotype Manipulation. — Fusible Metal.*" Charles V. Walker, Esq., Hon. Sec. The ingredients of a very manageable alloy are here given, and explicit directions on the subject of Clichée medals generally. The paper will be found worth reading by those who copy medals by the art of electrotype.

"*Methods of giving more force and constancy to the current of Galvanic Batteries, formed by a single liquid.*" Prof. Poggendorff, (Translation.) This was a description of several modes of preparing copper in a manner analogous to the platinization of platinum. Batteries constructed with metal thus prepared, possess a power little suspected by those who have not employed them.

"*Monthly Register for July of the Electric, &c., condition of the Atmosphere.*" W. H. Weekes, Esq. This valuable monthly document cannot be too well spoken of: it is prepared with very great diligence, and contains a mass of statistical information not elsewhere met with.

ON THE IODIDES OF POTASSIUM AND SODIUM.*

BY M. JUVENAL GIRAULT.

IODIDE OBTAINED WITH POTASSA ADULTERATED WITH SODA.

By making use of crude potassa for the preparation, by solution, of iodide of potassium, if the iodide of potassium were not alterable, and if the iodate were not susceptible, as remarked by Mitcherlich, of contracting, under certain circumstances, a peculiar crystallisable combination with this iodide, the product should be a pure and simple mixture of the compounds of sodium and potassium with iodine. On account of the extreme deliquescence of the iodide of sodium, the last crystals would contain most of that iodide, and the first, on the contrary, would be almost entirely formed of iodide of potassa; but the salt obtained from an operation of this kind has a much less simple composition. The crystals which are obtained from the liquors from which the iodate has been separated by simple concentration are formed of iodide of potassium, carbonate of soda, and iodate of potassa and soda in variable quantities; those obtained from the crystallisation of the residue of the calcination are formed of iodide of potassium and sodium, and of a considerable quantity, this time, of carbonate of soda. The possibility of this composition will be evident, I think, from the examination of the special properties of each of the halogen compounds of which I am about to treat.

IODIDE OF POTASSIUM.

There exists only one well-defined iodide of potassium; it is that which corresponds with the protoxide of that metal. Under the improper names of biniodide and teriodide of potassium—names which the single relation of the composition of the peroxide with the teriodide seems to warrant, we designate the solution, in a solution of neutral iodide, of a quantity of iodine equal to, or double, that which the salt in solution contains: such are those semi-combinations employed by M. Lugol, and since, by others, under the several names of *rubefacient ioduretted solution* and *caustic ioduretted solution*.

That which is called iodide of potassium in commerce is the fused iodide; the hydriodate is the crystallised iodide, which should not contain water, but which retains it in quantities varying from 2 to 10 per cent.: is it only on account of this water that the fused iodide has long fetched nearly double the price of the hydriodate? Assuredly not. The reason is, that in preparing the fused iodide, there is a considerable loss.

When exposing iodide of potassium to the action of heat, the temperature is raised, the crystals are destroyed, undergo igneous fusion, and very soon disengage abundant vapors, being volatilised without decomposition, even in contact with the air. Oxygen and carbonic acid have no action on this salt; nor does it undergo any alteration when exposed to the air, whether wet or dry: a current of carbonic acid and one of oxygen simultaneously directed through a solution of this salt did not effect any modification in it, even at a temperature of 80° C.

When iodine is gradually added to a cold concentrated solution of potassa, the lower part of the liquor immediately turns of a brown-red color, then, by the slightest agitation, this color is communicated to the whole of the

* *Journal de Pharmacie, July* 1841.

liquid, and the iodine is almost immediately and entirely dissolved, accompanied by a disengagement of heat; and if an excess of iodine has not been used, the liquor gradually loses this color, again becomes limpid, and at the bottom of the vessel is found some iodate partly precipitated; another portion of this iodate is dissolved in the iodide; that is because this salt, almost insoluble in pure water, is much more soluble in the solution of iodide of potassium, and because, under the influence of an excess of alkali, a basic iodate is formed, which is still more soluble. To avoid the influence of an excess of alkali, let the iodine be used in excess; this iodine is energetically retained, and nothing less than complete desiccation, almost to fusion, is required, to entirely volatilise it. When the residue is then treated by a small quantity of water, the iodate is almost wholly separated from it: there remains only to decompose it at a temperature not capable of volatilising the iodide resulting from its decomposition.

IODIDE OF SODIUM.

Sodium combines with iodine, and, like potassium, forms with that metalloid a compound corresponding with its first degree of oxygenation. The iodide of sodium, like that of potassium, and all the soluble iodides,—the fact may be generalised,—is capable of dissolving a certain quantity of iodine; but it disengages it with great facility, and in this respect it differs from the iodide of potassium. It is capable of crystallising in flattened rhomboidal prisms, longitudinally striated, of a lamellar texture, and perfectly transparent; its crystals contain 24 per cent. of water of crystallisation: when sufficiently dried, if exposed to rather damp air, they absorb moisture and fall into a state of deliquescence: if the air is too dry, they effloresce; if too warm, they liquify in their water of crystallisation. To obtain them in such a state as that they may be preserved, they must be placed between some folds of blotting paper, spread on a sieve, and placed in an oven heated to 25° C., and left there only so long as may be necessary; they must then be immediately enclosed in a previously dried flask sealed with emery: this flask should be of sufficient size to hold the dried salt, but no larger. These precautions are indispensable to its conservation. If the crystals of this salt be exposed to heat, they lose their water of crystallisation, effloresce, then the iodide enters into fusion at an elevated temperature, and finally, if the temperature be sufficiently high, it is volatilised, but at a much higher temperature than is required for the volatilisation of iodide of potassium; efflorescence, fusion, and even volatilisation, take place without alteration out of contact of the air. On cooling, the iodide solidifies, acquires a pearly appearance, and, removed from the influence of the air, it may be kept for an indefinite period. If this salt has experienced the contact of the air, it is quite otherwise: iodide of sodium contained in a perfectly sealed bottle, but of whose capacity it occupies only a portion, acquires a red color, which becomes more and more intense if the bottle be occasionally opened; this is because, on account of the air contained in the flask, part of the iodide is decomposed, passing to the state of carbonate of soda, and disengaging its iodine, which communicates a rose tint to the salt: but if, placing a certain quantity of this iodide in a glass retort, it be submitted to a heat sufficient to effect its fusion, and then, after cooling, if the air be allowed to enter, the latter rushes into it, acts only on the surfaces which it can reach, and by its carbonic acid and oxygen forms carbonate of soda and iodu-retted iodide.

Iodide of sodium is excessively deliquescent, and consequently, very soluble in water; alcohol likewise dissolves it when it is not too concentrated. A solution of this salt exposed to the air undergoes only an excessively slow alteration: the crystals of this iodide are much more rapidly altered, and the anhydrous salt still more quickly; also a mixture of iodide of potassium and sodium being given, it is only by a desiccation carried almost to fusion, and successive exposures to the air and to heat, that iodide of sodium can be converted into carbonate of soda.

A current of carbonic acid driven into a solution of this salt does not cause it to undergo any alteration, even at a temperature of 70° or 80° C. A current of oxygen, driven into it simultaneously with the carbonic acid, does not render the action more effectual, yet this salt, in contact with the air, cannot be preserved.

When iodine is projected into a very concentrated solution of caustic soda (36° cold), it goes to the bottom, turns black, loses its metallic lustre, and gives a slight amber color to the liquor: the liquid gradually turns yellow, and the iodine, being covered with a white, opaque layer of iodate, acts no more. If the solution be now diluted, or if in the first instance a weak solution was used, the reaction is operated in the same manner as with potassa, with the difference, however, that it is impossible to obtain iodide of sodium free from carbonate of soda, and, consequently, from iodu-retted iodide: that iodate of soda, being susceptible of combining with iodide of sodium, remains in solution notwithstanding the concentration of the liquors without heat, and that if they be submitted to heat, the greater part is precipitated on account of the destruction of the compound of which it made part, but that some of it still remains in the state of simple solution; that, moreover, from the time of the calcination of the iodate and the iodide, soda is again made, and that an alkaline iodide is

obtained: this iodide ought, therefore, to be prepared by double decomposition.

A circumstance in which the alteration of the iodide of sodium is rendered particularly evident is as follows:—

Having treated the proportional mixture of iodate of potassa and iodide of potassium obtained from a caustic solution by charcoal, I saw a continuous disengagement of carbonic acid without the slightest loss of iodine, and the washed residue gave pure white, and neutral or scarcely alkaline iodide; then the same experiment having been repeated with the corresponding compounds of soda, gave abundance of iodine during the calcination, and the iodide obtained was mixed with carbonate of soda, which crystallised in the liquor. It is therefore by analogy, without doubt, that in M. Orfila's work,—the only one, perhaps, in which the excellent practice of calcining the mixture of iodate of potassa and iodide of potassium with wood charcoal is detailed and recommended,—that chemist, in the article on *Iodide of Sodium*, gave the same process.

Without seeking to draw from the preceding facts more important conclusions, it may be said that there is an advantage in preparing iodide of potassium by double decomposition, and that, on the contrary, iodide of potassium may advantageously be prepared on the large scale by the caustic solution, taking into the account the solubility of iodate of potassa in the iodide, and calcining the mixture of the two salts with charcoal, which would allow of the decomposition of the iodate at a very low temperature, so as not to volatilise any of the iodide of potassium. It must be borne in mind that this simple and convenient *modus operandi* is not applicable to the employment of the potassa of commerce, which contains soda and sulphate.

The preparation of iodide of potassium by double decomposition, being disengaged from all accessary phenomena, and requiring no other apparatus than those which all apothecaries have at hand, may for these reasons sometimes be preferred; it is ordinarily executed by means of iodide of iron: but as this iodide is eminently alterable, and presents very serious inconveniences, it appeared to us useful to examine whether zinc, the use of which was feared would not offer peculiar advantages, and whether it really presented the inconveniences attributed to it.

PREPARATION OF IODIDE OF POTASSIUM, BY MEANS OF IODIDE OF IRON.

In treating iodide of iron by carbonate of potassa, the precipitate of hydro-carbonate which is formed retains a considerable quantity of iodine, apparently kept in a peculiar state, for it can be removed only by repeated and long boiling. The coagulated condition of the precipitate renders filtration very slow. Another difficulty arises from the nature of the precipitate, that of accurately ascertaining when the saturation is complete, and in order to do so, time must be given for the liquors to settle, or a portion must be filtered: it is very important not to let any excess of iodide of iron exist, as it would color the liquors by its conversion into ioduretted iodide, and would render them turbid by the ochrey deposit to which it gives rise during evaporation. It is to avoid the inconveniences of this excess of iodide of iron that the alkaline solution is used for effecting the decomposition; it is, however, very rarely that we can obtain an iodide free from oxide of iron, and whose crystals may immediately be made use of. M. Guibourt's recommendation to boil the solutions for a long time on the precipitate in order to effect the peroxidation of iron, renders the process excessively slow, without conducing to good results: the only advantages it presents are the modification of the state of the precipitate and the more ready filtration of the liquors. The preparation of the iodide of potassium by iodide of iron therefore requires minute details which render the process of caustic liquors preferable. I should add that nothing can be done with the oxide of iron which is deposited; it retains in the state of insoluble combination an oxido-iodurel which is not destroyed by repeated calcination, even when moistened with oil or acetic acid.

If zinc be substituted for iron, the following differences present themselves:—

Zinc is dearer than iron; but the hydro-carbonate of zinc which may be obtained from it, may be made use of in the preparation of pure and white oxide of zinc. The iodide of zinc is more slow of production than that of iron, but the operation is effected in a few days, without the aid of heat, or at a gentle temperature, when the zinc is properly divided. The iodide of zinc is alterable in the air when it is dry, but very slightly so when in the state of solution, and the little tendency of zinc to peroxidise explains this difference. The lead, copper, iron, silica, and the traces of manganese which some of the varieties of zinc contain are not of any importance; the lead and copper are either not attacked, or form insoluble iodides; iron, if an excess of zinc be retained, remains in the deposit; not a trace passing into the liquors, and it is for this reason that the calcined hydro-carbonate gives a perfectly white oxide; the silica is not attacked.

The following is the modus operandi to which we had recourse:—

Finely divided zinc was treated by iodine and water in close vessels; it was stirred, and the iodine gradually and successively added, but in such a manner as always to leave an excess of zinc; the liquors were filtered, and the deposit washed in boiling water; the

washing water was cool before being added to the first liquor.

Having the solution of iodide of zinc, a boiling solution of carbonate of potassa was poured in, and maintained at the boiling point: after every new affusion of iodide, and after an instant of trial, the deposit at first formed at the bottom was brought to the surface by the disengagement of carbonic acid gas which is separated from it, so that when, after the addition of a little of the solution, no disengagement of gas is perceptible, nor any precipitate swimming at the top, it may be presumed that the saturation is complete, and even in excess. The precipitate occupying the bottom, by the addition of a little cold water, the boiling is stopped for an instant; the liquor being cleared, it is easy to pour into it some solution of carbonate, of which a portion had been set aside for this purpose; an excess of this solution is added, which does not react on the precipitate, so that the solutions of iodide of potassium may contain no zinc. If by misfortune an excess of iodide of zinc had been left in, we should have iodide of zinc in the solution; but during the evaporation, and especially during that of the supernatant liquors, it would be decomposed, and would give a white precipitate which might be separated by filtration. The solutions are then filtered, and this operation is performed with facility; then the deposit, treated by being twice boiled in water, does not retain any more alkaline iodide: the washing waters are evaporated in a suitable manner. As to the hydro-carbonate of zinc, it contains a small quantity of insoluble iodoretted iodide of zinc; but submitted to a red heat, it loses that iodide, for the most delicate tests do not denote its presence after calcination.

IODIDE OF LEAD.

Only one iodide of lead is generally admitted; many facts, however, tend to shew that there exists another, containing more iodine; however, supposing there be but one, we shall now devote ourselves to the phenomena presented by its preparation. According to the Pharmacopœia, this iodide is prepared by the double decomposition of iodide of potassium and neutral acetate of lead, both pure; but it is important to see what may be the consequences of the employment of an iodide presenting the alterations whose existence we have just proved. It sometimes happens that acetate of lead, said to be neutral, is not perfectly so: the deposit of carbonate which remains undissolved from the time of its treatment indicates that it has undergone some alteration, and a very delicate way of verifying it consists in blowing into the solution, by means of a tube, the air expired from the lungs, which contains carbonic acid, and which immediately renders the solution of the basic acetate of lead turbid, and does not impair the transparency of the solution of neutral acetate. When it is proved that an acetate is basic, the employment of this salt causing the formation of an iodide with a mixture of oxide, oxido-iodide (Denot), should its use be rejected until brought to the neutral state by adding to its solution sufficient dilute acetic acid or distilled vinegar? The following is what experiment has taught us in this respect:—

If into a solution of subacetate of lead a solution of iodide of potassium must be poured until no more precipitate is formed, a precipitate of dirty greenish white oxido-iodide is obtained, which, put in contact with water acidulated by acetic acid, allows all its oxide to be dissolved, and acquires the beautiful yellow color which characterises iodide of lead. It is then easy to re-establish a straw-colored iodide mixed with oxide.

With the view of neutralising a solution of basic acetate of lead, dilute acetate acid is added to it; if an excess of acid were added, when the solution of iodide of potassium is poured in, the excess of acid would liberate some of the iodine, and we should have an iodoretted iodide of lead. It will be the same if, employing alkaline iodide of potassium, and even very alkaline, in order to prevent the free alkali from precipitating the oxide of lead, we put acetic acid into the solution of acetate, for the acid, as soon as it is in contact with the alkaline iodide, will liberate iodine, and we shall have a greenish or deep blue iodoretted iodide of lead, which will retain the excess of iodine so energetically as not to part with it by simple nor by alcoholic washings, nor even by contact with a caustic solution of potassa or soda. If iodide of potassium, containing carbonate of potassa were employed, the iodide of lead might be deprived of the carbonate of lead precipitated by it as I have said above; but if the iodide of potassa contained iodate, the iodate of lead would remain in the iodide of that metal, and could not be removed from it. A simple and advantageous process, inasmuch as it dispenses with the use of iodide of potassa, consists in decomposing iodide of iron prepared on purpose, by a solution of acetate of lead. It is true that the iodide of lead, however rapidly the decomposition may have been effected, remains mixed with iron, and detains it, unless very promptly removed by repeated washings; but this oxide is almost completely removed by a few washings with water acidulated by acetic acid, and the iodide remains pure and of most beautiful color. I have used this process very successfully at the *Pharmacie Centrale*, according to M. Soubeiran's recommendation.

ON GUAIACIC ACID, AND ON EXTRACT OF GUAIACUM.*

BY M. THIFRRY.

When I undertook to make some experiments on guaiacum, I thought less of the acid which forms the subject of this notice than of the aromatic principle developed when the guaiacum is concentrated in order to extract it. However, the resemblance which exists, between the odour of this extract and that of benzoic acid, gave me the idea that in guaiacum there might exist an acid analogous to benzoic acid. Always pursuing my first idea, and after many fruitless attempts, I treated extract of guaiacum—prepared according to the *Pharmacopœia* — with sulphuric ether, several times, without the aid of heat. The ether being evaporated in a porcelain capsule, yielded a residue of the consistence of honey, with a very agreeable odor similar to that of vanilla. It somewhat resembled recent balsam of Tolu. From this kind of resin, for the first time I obtained guaiacic acid. For that purpose, it is sufficient to put a small quantity of ethereal extract of guaiacum into a porcelain capsule, to cover this capsule with a sheet of blotting paper, pasted on the edges as in Mohr's apparatus for preparing benzoic acid, and to place over the capsule a glass funnel which is fastened to it by means of a strip of paper pasted. This small apparatus is put on a furnace, after having adapted to the furnace a slate perforated with a round hole—an arrangement by which the heat is kept at the bottom of the capsule, and not too much at the upper part of the apparatus. Thus arranged, it is cautiously heated, and that with only a few red hot coals. After a few minutes, the matter swells up, and white vapours are disengaged, and are deposited on the sides of the funnel as well as on the surface of the blotting paper, under the form of small brilliant needles. If it be rather too strongly heated, a brown oil is volatilised and colors the crystals.

But in this operation only a very small quantity of acid is obtained, and from other experiments I have found the resin of guaiacum answer the purpose best.

PROCESS FOR OBTAINING GUAIACIC ACID.

One pound of fine resin of guaiacum of commerce is taken, powdered and treated by alcohol at 56 C. in sufficient quantity to dissolve it entirely: this tincture must afterwards be filtered, distilled in an alembic placed in a sand-bath, to obtain three-fourths of the alcohol used. The operation terminated, there remains in the vessel a yellowish liquor which floats on the surface of the resin: it is allowed to cool, and is filtered. This liquor is acid; it is saturated with baryta water, which forms with it a soluble salt; this liquid is evaporated in the sand-bath until reduced to one-half, and this guaiacate is decomposed by dilute sulphuric acid which is added until no more precipitate is formed. In this operation, care is necessary: it is better that a small quantity of salt should remain undecomposed, than that there should be an excess of sulphuric acid, since the latter, when the solution of guaiacic acid is being concentrated, reacts on it and decomposes it. However, if too much acid be put in, a few drops of baryta water may be added. The liquor is filtered to separate the sulphate of baryta, and it is evaporated in the sand-bath until it acquires a syrupy consistence. This extract is put into a mattrass, sulphuric ether is poured on it, and it is left for some time in contact, taking care to stir it often; the ether dissolves the acid of the guaiacum, and does not attack the extractive matter; the liquor is poured into a capsule, the ether is allowed to evaporate, and the guaiacic acid is deposited on the sides of the vessel, under the form of very irregular flocks. This acid, thus obtained, is not in a state of purity; it retains a little resinous matter, and, in order to purify it, it must be sublimed by the process which I have described above. But to succeed well in this operation only small quantities must be operated on, and it is obtained in fine needles.

The acid of guaiacum is soluble in ether, alcohol, and water.

This acid differs from benzoic and cynnamic acids, inasmuch as the latter are but sparingly soluble in water, while guaiacic acid is perfectly soluble in that liquid.

The action of this acid on certain salts is still more dissimilar from that of these two acids. Time has not yet permitted me to terminate the series of experiments which I intend to make and to publish, accompanied by the organic analysis of this acid.

M. Righini (*Journal de Chimie Medicale*, 1836,) gave a notice concerning guaiacic acid. He distilled a tincture of guaiacum wood, separated the residue of the distillation from its resin, made a paste with the decanted liquid and pure magnesia, and introduced it into a glass retort: "There results from it," says he, "by distillation, an aromatic and limpid liquid. By dissolving the *caput mortuum* in pure water, and by decomposing it with dilute sulphuric acid, sulphate of magnesia is formed, and a white substance is deposited, which, dissolved in water and evaporated, forms an acid body crystallizing in needles." I have twice carefully repeated M. Righini's experiment, and I obtained, as a product of distillation, an empyreumatic, ammoniacal liquor, reddening turnsole paper. The *caput mortuum*, treated as he directs, yielded a very light flocculent precipitate, which, when filtered and applied to paper, gave it the appearance of being varnished. But this was not guaiacic acid; it was a resinous matter, which, saponi-

* *Journal de Pharmacie*, July 1841.

fied by the magnesia, was precipitated when no longer held in solution by that alkali. Guaiacic acid, being very soluble in water, could not be precipitated, as is the case in the preparation of benzoic acid by lime. Thus the acid of guaiacum does not crystallize in needles in these different solvents.

If, in this process, instead of employing pure magnesia, the liquid remaining in the sand-bath had been saturated with baryta-water, the same results as mine would have been obtained; but it is necessary to act on a large quantity of guaiacum, and to employ much alcohol.

EXTRACT OF GUAIACUM.

Pharmacologists are not agreed concerning the preparation of extract of guaiacum: some demand that the deposit which is formed in the decoction, on cooling, should be separated; others, on the contrary, are of opinion that it should be left in. The different experiments which I have made to obtain guaiacic acid from extract of guaiacum have led me to prepare this extract in three different manners:—

1st, According to the formula of the *Pharmacopœia*, and with the addition of alcohol at the end of the evaporation.

2d, By long boiling, and by separating the deposit.

3d, By macerating guaiacum for a long time, without heat.

The first of these extracts has a powerful smell, the second less, and the third no smell.

The first extract contains more acid than the second, and the third none.

If, as is very probable, the extract of guaiacum owes its properties to a peculiar balsamic resin, and to the acid contained in it, the formula of the pharmacopœia should be preferred.

That which I call a balsamic resin is the ethereal extract of guaiacum obtained by treating extract of guaiacum by sulphuric ether. This extract, dissolved in alcohol at 50 C., and mixed with syrup, gives a liquid which has the taste and odor of vanilla.

Besides the balsamic resin, extract of guaiacum contains another resin, a black matter insoluble in alcohol and soluble in ammonia, salts of lime, and iron in very considerable quantity.

ON THE RESIN OF GUAIACUM.

LETTER FROM M. PELLETIER TO M. CAP.

Paris, June 2, 1841.

MY DEAR COLLEAGUE,—

I have been informed that a notice concerning the resin of guaiacum has been sent for publication to the *Journal de Pharmacie*.* To the knowledge of many of my colleagues, I have been for some time engaged on a work on the same subject. I have already collected much materials, but it is not finished, and can only appear in an early number of the *Journal de Pharmacie*. However, not to lose entirely the merit of my researches, allow me to point out to you some of the results which I have obtained.

I first made the elementary analysis of guaiacum resin in translucid tears. The following is its composition:—

Carbon	71·000
Hydrogen	7·033
Oxygen	21·967

Guaiacum resin, even in transparent tears, cannot, however, be regarded as an immediate pure principle; it contains, in the proportion of about $\frac{1}{10}$, a resin insoluble in ammonia and a yellow colouring matter. There are several processes for obtaining *guaiacine*, namely, the peculiar principle of the resin of guaiacum. That which I found most successful consists in pouring into the tincture of guaiacum resin, an alcoholic solution of acetate of lead. This solution must be added, by degrees, the precipitates must be fractioned, and the last that are formed must be rejected. The precipitate must be well washed, first with water, and then with alcohol, and decomposed by a current of sulphuretted hydrogen; finally the guaiacine must be separated from the sulphuret of lead by means of alcohol.

Guaiacine may also be obtained by treating the tincture of guaiacum by hydrate of lime; a compound of lime and guaiacine is obtained, from which the latter substance may easily be separated.

Guaiacine possesses in the highest degree the property of turning blue in the air, under the influence of light—a property which was well studied, in guaiacum, by Dr. Wollaston and M. Biot. The effect of coloration is produced more quickly in aerated water than in water deprived of air; however, it also takes place, in this case, accompanied by a disengagement of hydrogen. Bodies having an affinity for oxygen, such as sulphurous acid, sulphuretted hydrogen, proto-sulphate of iron, and the proto-chloride of tin decolor guaiacum which has turned blue. Exposure to the air and light re-establishes the color.

Damp chlorine, or chlorine in solution in water, turns guaiacum blue; an excess of chlorine causes a green and then a yellow color. In the green and yellow states the guaiacine is altered; in the blue state, it is only oxygenised, and may be decolored by sulphuretted hydrogen, &c.

I have already made some combustions of pure guaiacine and of its compounds, in order to determine its elementary constitution; this part of my work is not yet completed. I still have some doubts as to its capacity of saturation, and, notwithstanding its property of

* See the foregoing article.—EDS. CHEM.

combining with salifiable bases, I hesitate to regard it as an acid.

I might touch on many other points, but I will desist; this note having no other object than that of obtaining priority, by making it known that I have for some time been engaged in the examination of guaiacum.

Agréez, &c.

J. Pelletier.

NEW INVESTIGATIONS CONCERNING INDIGO.*

BY M. A. LAURENT.

Indigo, submitted to the action of chromic or nitric acid, is converted into a new substance which I call *isatine*, whose composition may be represented by indigo, plus two atoms of oxygen.

The formula of indigo being

$$C^{32}\ H^{10}\ N^2\ O^2,$$

that of isatine is

$$C^{32}\ H^{10}\ N^2\ O^2,\ O^2.$$

Under the influence of alkalis, isatine is acidified, absorbing one atom of water, and gives rise to a new compound, isatinic acid, the formula of whose salts is

$$C^{32}\ H^{12}\ N^2\ O5.$$

Isatine, treated by ammonia, forms six or seven different bodies:—

1st. Isatinate of ammonia:

2nd. Imosatine, which is a grey crystalline matter, the composition of which is represented by isatine, one equivalent of whose oxygen is substituted by 1 equiv. of imide = Im (HN), that is to say, by the formula

$$C^{32}\ H^{10}\ N^2\ O^2\ O\ Im:$$

3rd. Imesatine, which is crystallised in fine yellow rectangular prisms, and whose composition may be represented by isatine, of which 2 equiv. of oxygen are replaced by 2 equiv. of imide

$$C^{32}\ H^{10}\ N^2\ O^2,\ Im^2.$$

Under the influence of potassa, it is converted into isatinic acid:

4th. Imasatic acid: this body which is of remarkable beauty, crystallises in rhomboïdal tables of a pure shining red. With bases it forms yellow salts. Its composition may be represented by one equiv. isatine, and half an equiv. of ammonia

$$C^{32},\ H^{10}\ N^2\ O^2,\ O^2 + H^3\ N.$$

But this body does not contain ammonia; it should rather be represented by imosatine acidified by one atom of water:

5th. Amazatine, which is a bright yellow powder, and whose composition may be represented by isatine, of which 1 equiv. of oxygen is replaced by 1 equiv. of amide Am = $H^4\ N^2$,

$$C^{32}\ H^{10}\ N^2\ O^2,\ O\ Am:$$

6th. A matter crystallised in rhomboïdal bracteæ of a golden yellow, but which I have not yet analysed:

7th. Isame, whose composition is doubtful,

$$C^{32}\ H^{12}\ O^{21}\ O\ H^2.$$

Isatine, submitted to the influence of chlorine, is converted into chlorisatinase (Erdmann's chlorisatine). According to my analysis, its composition must be represented by isatine, of which two atoms of hydrogen are substituted by two atoms of chlorine

$$C^{32}\ (H^8\ Cl^2)\ N^2\ O^2,\ O^2.$$

Chlorisatinase, treated by the alkalis, absorbs one atom of water, like isatine, and gives chlorisatinasic acid, whose formula in salts is

$$C^{32}\ (H^8\ Cl^2)\ N^2\ O^2,\ O^2,\ H^2\ O.$$

The foregoing compound is mixed with chlorisatinase (Erdmann's bichlorisatine). Its composition is represented by isatine, of which four atoms of hydrogen have been substituted by four of chlorine

$$C^{32}\ (H^6\ Cl^4)\ N^2\ O^2,\ O^2.$$

Chlorisatinase, treated by ammonia, forms a body analogous to imesatine: it is yellow, and crystallised, and its formula is

$$C^{32}\ (H^8\ Cl^2)\ N^2\ O^2\ Im^2.$$

It is imesatine in which 1 equiv. of hydrogen is substituted by 1 equiv. of chlorine.

Isatine treated by bromine is converted into bromisatinese, (bibromisatine of Erdmann); according to my analysis, its formula should be

$$C^{32}\ (H^7\ Br^4)\ N^2\ O^2,\ O^2.$$

Bromisatinese, under the influence of potassa, absorbs one atom of water, and forms bromisatinesic acid whose formula in salts is

$$C^{32}\ (H^6\ Br^4)\ N^2\ O^2,\ O^2.$$

Bromisatinese put in contact with anhydrous ammonia loses one atom of water, and gives bromimesatinese, which may be represented by bromisatinese, of which 2 equiv. of oxygen are replaced by 2 equiv. of imide, or by

$$C^{32}\ (H^6\ Br^4)\ N^2\ O^2\ Im^2.$$

By digesting isatine with hydrosulphate of ammonia, a deposit of sulphur and a crystalline matter which I call *isathyde*, is formed. Its formula is that of isatine, plus 2 atoms of hydrogen. It is formed by virtue of the following reaction:—

$$C^{32}H^{10}N^2O^4 + H^2S = C^{32}H^{10}N^2O^4,\ H^2 + S.$$

Isathyde treated by potassa, is converted into isatinic acid, and into a new compound which I have not studied.

According to Erdmann, chlorisatine treated by hydro-sulphate of ammonia, gives rise to chlorisatide, whose formula is

$$C^{32}\ H^{10}\ Cl^2\ N^2\ O^2.$$

According to my analyses, it should be

$$C^{32}\ (H^8\ Cl^2)\ N^2\ O^4,\ H^2.$$

Isatine treated by sulphuretted hydrogen gives a deposit of sulphur, and a new compound which I call *sulphesathyde*, and whose composition is represented by the formula

$$C^{32}\ H^{10}\ N^2\ O^2,\ S^2,\ H^2.$$

The following equation explains its formation:

* *Comptes Rendus de l'Académie des Sciences:* No. 2, July 12, 1841.

$C^{32}\,H^{10}\,N^2\,O^2,\,O^2 + 3\,H^2\,S = C^{32}\,H^{10}\,N^2\,O^2,\,S^2,\,H^2 + H^4\,O^2 + S.$

It is isathyde of which two atoms of oxygen are replaced by two atoms of sulphur.

Sulphesathyde treated by potassa, gives rise to at least five different compounds.

1st. Sulphasathyde crystallises in white bractese; its formula is

$$C^{32}\,H^{10}\,N^2\,O^2,\,OS,\,H^2.$$

It is sulphesathyde, of which one atom of sulphur is substituted by one of oxygen:

2nd. Indine, which chrystallises in microscopic crystals of a most beautiful rose-carmine color. Its composition is

$$C^{32}\,H^{10}\,N^2\,O^2\,H^2;$$

it is sulphesathyde minus two atoms of sulphur. This compound is isomeric with reduced indigo:

3rd. Black prismatic crystals which are a rather unstable combination of indine and potassa:

4th. Hydrindine crystallized in small colorless prisms, and whose composition may be represented by indine plus half an equivalent of water, that is to say, by

$$C^{32}\,H^{10}\,N^2\,O^2\,H^2\,HO^{\frac{1}{2}}.$$

The elements of this half equivalent of water, are not in the state of water in hydrindine: however, this substance is converted into indine, at a high temperature.

5th. Long silky needles which are easily destroyed, and which are a compound of potassa and hydrindine.

Indine, treated by bromine, gives rise to a violet colored pulverulent compound, which appears to be the bromindine of Erdmann,

$$C^{32}\,(H^8\,Br^2)\,N^2\,O^2,\,H^2.$$

By boiling indine, or hydrindine, with nitric acid, a very beautiful purple-violet-colored pulverulent matter is formed: I call it *nitrindine*. Its composition is represented by this formula:—

$(X = N^2\,O^4)\ldots C^{32}\,(H^6\,OX)\,N^2\,O^2,\,H^2.$

It is indine, of which 2 equiv. of hydrogen have been substituted by 1 equiv. of nitric acid, or rather, by 1 equiv. of hyponitric acid and 1 equiv. of oxygen.

ON THE PRODUCTS OF THE OXIDATION OF GELATINE.*

BY M. J. PERSOZ.

In the course of my investigations concerning the molecular constitution and the classification of organic substances, I have observed a fact which I think should now be submitted to the consideration of chemists and physiologists.

Gelatine, a neutral, nitrogenous substance, submitted to an oxidising influence, is susceptible of being converted into hydrocyanic acid, ammonia, and carbonic acid. Besides these products, which are formed in considerable quantities, there is always produced a small quantity of one of the volatile, odorous, fatty acids whose existence was made known by M. Chevreul. The following are the circumstances under which this kind of oxidation takes place:—

40 grammes of gelatine dissolved in two quarts of warm water, acidulated by 300 grammes of sulphuric acid, were introduced into a tubulated retort, capable of containing about three quarts, and to which was adapted a receiver fitted with a tube for collecting the gases. This acid solution was cooled, and 160 grammes of bichromate of potassa were introduced into it, after which the retort was heated. A reaction speedily commenced; it was manifested by an abundant disengagement of carbonic acid, which was quite pure, as we ascertained by a great number of experiments. In proportion as this carbonic acid was disengaged, there was condensed in the receiver a liquid having a strong odor of bitter almonds, and at the surface of which a small quantity of oily matter was remarked.

In order to prove the presence of hydrocyanic acid in this liquid, obtained by distillation, we did not confine ourselves to the use of the ordinary reagents, such as nitrate of silver, the salts of iron with potassa, and the acids; but a portion was put in contact with well-ground oxide of mercury, after which it was filtered and evaporated in a suitable manner. When this liquor cooled, we obtained crystals of perfectly pure cyanuret of mercury, from which cyanogen was disengaged by distillation.

As to the residue left in the retort after distillation, it was concentrated in order to separate by crystallization the greater part of the alum of chrome, formed by the alteration of the chromate of potassa at the expense of the elements of the gelatine. The supernatant liquors, concentrated *de novo*, furnished colored crystals, which, washed with a little water, became colorless, and were easily recognised to be sulphate of ammonia.

This experiment, which we made for the first time in June 1840, has since been several times repeated; but we have never obtained any other products than those just mentioned.

There is no occasion here to dwell on the inferences to be drawn from the above experiment, as to the molecular arrangement of the elementary principles of gelatine. However, we think it should be remarked, that in not losing sight of the fact that chromic acid, by oxidizing the organic matters, determine the formation of products which are generally the same as those engendered by the same organic matters, when, under suitable circumstances, they are altered by the air or by oxygen, we are naturally to ascertain by analysis whether, among the products of the normal or abnormal secretions of the skin, some ammonia, hydrocyanic acid and its compounds are not formed, namely, the compounds of cyanogen and formic acid. A fact which took place about twelve

* *Comptes Rendus*, No. 3, July 19, 1841.

years ago would tend to make us think that in certain cases of suppuration, hydrocyanic acid may be formed. My friend, Dr. A. Nonat, then pupil at the *Hotel Dieu*, was in that capacity charged with the dressing of patients. One day he brought to me some lint and bandages stained of a blueish green, by their contact with the purulent matter of the wound of a patient. Might not this color be attributed to the prussian blue which may have been formed by the action of the pus on the iron mould, which may accidentally have existed on the linen and lint used for dressing the wound? It would be very easy to verify this by means of tissues impregnated with a ferruginous salt, which might then be used for dressing certain wounds.

M. Dumas remarked that in a case of the hands being burnt by concentrated potassa, he had observed this bluish suppuration for several days.

INVESTIGATIONS CONCERNING THE COMPOSITION OF ANTIMONIURETTED HYDROGEN.*

BY M. LASSAIGNE.

The discovery of antimoniuretted hydrogen by Thomson, in acquainting us with the existence of this gaseous compound, its principal properties and distinctive characters, and the circumstances in which it is produced, has, however, left us ignorant as to the proportions in which these two bodies are combined. With the view of supplying this deficiency we have tried some experiments on the subject, and have devoted ourselves to the study of this gas.

If the experiments which we have made have not yet enabled us to obtain this gas in a state of purity, but always mixed with a very large quantity of free hydrogen, we think that the method which we adopted for analysing this mixture, and for absorbing and decomposing the antimoniuretted hydrogen, should allow its true composition to be determined.

Indeed, it is known from the experiments of MM. Simon, Thomson, Vogel, and from our own, that the solution of nitrate of silver is decomposed at the ordinary temperature by antimoniuretted hydrogen; and that there results from this reaction a black precipitate of silver and antimony in the metallic state. We availed ourselves of the decomposing action of this salt for estimating the proportions in which these two metals are precipitated, and for deducing from their respective quantities the proportion of hydrogen previously combined with the antimony.

By combining antimony with zinc in certain proportions, a compound is produced, as the above chemists have announced, which is readily dissolved by weak sulphuric acid at the ordinary temperature, and which furnishes more or less antimoniuretted hydrogen. It is important, however, as we have ascertained, that the alloy should not contain an excess of antimony, for then it remains for the greater part insoluble, and consequently does not yield hydrogen. The different alloys which we made have proved that that which is best adapted for this preparation, and gives an uniform result, is composed of 12 parts, by weight, of zinc, and 8 parts of antimony. The other alloys formed in the proportions of 12 of zinc to 18 of antimony, or of 12 of zinc and 12 of antimony, are but very feebly attacked by weak sulphuric acid, and the action soon stops.

The gas which is obtained by dissolving the first alloy, that is to say, that in which the zinc and the antimony are nearly in the proportion of 3 atoms of the first, to 1 atom of the second, is formed for the greater part of hydrogen and of a small quantity of antimoniuretted hydrogen whose volume amounts to from 1½ to 2 per cent. We determined this small proportion in the direct way, by passing under water, in a graduated bell-glass filled with gas, a certain quantity of nitrate of silver; this salt being agitated produces an absorption of 2 per cent. in volume.

Repeated experiments made on the gas obtained with this alloy have always furnished us nearly the same result; and although we varied the temperature, we found it impossible to obtain antimoniuretted hydrogen gas without the admixture of a large quantity of hydrogen, which has prevented us from studying its properties in a state of purity.

In our examination we proved that this gaseous mixture of hydrogen and antimoniuretted hydrogen was characterised by a slight odor of rotten eggs, although it had no action on a solution of acetate of lead. Abandoned to the action of direct and diffused light, it gradually deposits on the sides of the vessel a light, blackish, brilliant layer of metallic antimony, and the volume of gas is scarcely altered, even at the end of several days. Heated over mercury, in a bent tube, it deposits at a little below red heat, a light, greyish powder of antimony, which attaches to the sides of the glass, and after this prolonged calcination the volume of the gas is not perceptibly altered.

In order to determine the proportion of the hydrogen to the antimony, we slowly passed all the gas which was disengaged from a solution of the alloy through a solution of pure nitrate of silver; the black precipitate, collected, washed, and dried, was treated by nitric acid, which dissolved the silver and converted the antimony into a whitish powder of insoluble antimonious acid: the weight of the latter compound allows the proportion of antimony to be calculated: as to the propor-

* *Journal de Chimie Medicale*, August 1841.

tion of hydrogen, we deduced it from the weight of the silver precipitated, and from the quantity of oxygen which it must abandon to the hydrogen of the gas in being precipitated.

In submitting the antimoniuretted hydrogen gas twice to this proof, we ascertained that its composition might be represented by the following numbers:—

Antimony	97·581
Hydrogen	2·419
	100·000

This decomposition deduced from experiment comes very near to that which theory indicates in the supposition in which this gas would be formed like arseniuretted hydrogen, of one atom of antimony and three atoms of hydrogen; in this case, the theoretical composition would be:—

Antimony	97·734, or 1 atom.
Hydrogen	2·266, or 3 atoms.

New experiments yet remain to be made for investigating the means of obtaining this gaseous compound pure and without admixture of hydrogen: we intend to try some. Perhaps pressure and a low temperature may be sufficient for effecting this separation? In that case it would be possible to study all the properties of this remarkable compound, which seems to resemble arseniuretted hydrogen in most of its properties and in its composition.

ON A NEW MODE OF FORMING VALERIANIC ACID.*

BY M. C. GERHARDT.

Since the beautiful investigations of MM. Dumas and Stass concerning the formation of valerianic acid by potatoe oil, this acid has acquired a certain importance in organic chemistry: its study has become as necessary as that of the most common bodies, but in order to study it successfully, a more expeditious and less costly process of preparing valerianic acid was necessary, the employment of potatoe oil not presenting every requisite convenience, notwithstanding the admirable clearness of the reaction. I now make known a kind of reaction which appears to me to present, in this respect, every thing required.

When caustic potassa is fused, and when we introduce into it, by small portions at a time, blue indigo, this body is dissolved in it, and is decolored, giving rise to an abundant disengagement of hydrogen and ammoniacal gases. The alkaline residue is a mixture of valerianate and carbonate of potassa. When it is gently heated with sulphuric acid, large quantities of valerianic acid may be obtained. By this simple process I have prepared in less than one hour considerable masses.

The reaction is very clear; it is effected at the expence of the water. The carbon of the indigo is divided in two; it remains fixed in the state of valerianic and carbonic acid; all the nitrogen of the indigo is disengaged in the state of ammonia, and the excess of hydrogen of the water which yields the oxygen necessary for the production of the two acids, is also liberated:

$$C^{32}\,H^{10}\,N^2\,O^2 + 14\,H^2\,O = C^{20}\,H^{20}\,O^4 + 6\,C^2\,O^2 + N^2\,H^6 + 6\,H^2.$$

As soon as circumstances permit, I shall have the honor of communicating to the Academy, the analytical data relative to this interesting reaction.

* *Comptes Rendus*, No. 5, August 2, 1841.

REVIEWS.

Lectures on Chemistry, including its application in the Arts.—By Henry M. Noad.—Nos. II. and III. London, R. Hastings, 13, Carey Street; Scott, Webster, and Geary, Charter House Square.

The second and third Nos. of this work, fully confirm us in the opinion we gave of the first Number.

No. II. is occupied with the subject of Heat, which also extends to No. III; in the latter, however, a popular view of "Chemical Affinity, and the Theory of Definite Proportions" is commenced.

We recommend those of our readers who are novices in the beautiful science of chemistry, to purchase each number of this work as it appears, and to read it during the month: they will thus, at the end of a few months, unexpectedly find themselves possessed of very considerable chemical knowledge.

A Table of Analytical Chemistry.—Arranged for the use of the practical classes in the Pestalozzian Institution, Worksop. By James Haywood. Worksop; F. Sissons: London, Longman and Co; and Taylor and Walton, Upper Gower Street.

Of this table, we need say no more than that it is likely to prove of great utility to the young chemist, who stands very much in need of such a valuable assistant.

II. CHEMICAL MANUFACTURES.

MANUFACTURE OF COPPERAS.

To the Editors of The Chemist.

Elland, near Halifax, August 9, 1841.

Gentlemen:—

In consequence of the attention which my last letter received from you, I have determined to furnish your journal with a short article on copperas-making. This is a more purely chemical manufacture, and since there are many circumstances connected with it which are not generally known, I trust it will

prove acceptable to your numerous readers. I am of opinion that if certain parties were to furnish you with papers of this description, we should shortly be put in possession of a more correct history of science and manufactures than has ever yet been offered to the public.

The prevalence of extensive strata of coal in the parish of Halifax will, probably, in some degree, account for the numerous manufactures of copperas which are here carried on, inasmuch as the iron pyrites, which forms the beds of these establishments, is usually mixed along with the coal. Yet, however correct this assumption may originally have been, it does not hold good at present; for the dross which is extracted from the coal formations is not sufficiently abundant to supply the beds in question, and consequently it is usually brought from other neighborhoods.

Whilst there were fewer copperas-works, no doubt the pyrites were the product of the adjoining collieries, but when the former became more numerous, then the materials for supplying them were procured elsewhere.

That, however, iron exists in tolerable quantity in the strata of this parish is abundantly proved by the ochreous deposit let fall by the several streams. This deposit of peroxide of iron would seem to be brought from the coal-beds, or from the iron-stone usually found beneath the coal, and may be taken up by the water either as a sulphate or as a carbonate. Each of these, on being subjected to the action of the atmosphere, is converted into the peroxide already alluded to. That both suppositions have some foundation in truth, is shown by the presence of very slight quantities of free sulphuric acid, which I have occasionally detected in some of the waters of this parish, particularly in the vicinity of Elland, and also by the facility with which the sulphuret is converted into the sulphate by the aid of air and moisture, and by the fact, that the carbonate of iron, though rarely found native here, can scarcely be otherwise than formed in those situations where carbonic acid so often manifests itself. Choke-damp and fire-damp are very prevalent in the collieries of this parish.

Having thus pointed out the inducements which have ever been offered to speculators in the copperas trade to institute manufactures here, I must now show from what other sources the pyrites is obtained, which goes to constitute the various beds. The deficiency is usually made up by purchases from other parts, particularly from the neighbourhoods of Leeds, Wakefield, Dewsbury, and Huddersfield, where the coal formations are more remarkable, and the demand for it greater, and where, consequently, a large quantity of pyrites is yielded. Whilst the coal strata in the parish of Halifax rarely exceeds twenty or thirty inches in thickness, those in the places just mentioned, reach upwards of four feet. The former are found in two distinct beds, styled the *hard* and *soft*, about thirty yards asunder, the first, or hard bed, lying most superficial, and containing all the pyrites.

But it is not from the coal strata alone that bi-sulphuret of iron is obtained: it sometimes occurs in rounded nodules having a radiated structure, divergent from a common centre in the beds of clay which are so common in Yorkshire. These nodules vary in size, from that of a bomb to that of a large cannon ball. When extracted from the coal, or clay, they are either round or in cubes, or in some form nearly allied to the latter. They vary much in color, being yellow or white, possessing a high metallic lustre resembling gold or silver. Their sp. gr. usually agrees with that assigned to them in books, being nearly 5.000. Should it be higher, we may take it for granted that they are not free from admixture, and when such is the case, I have frequently found the foreign material to consist of galena. Sulphuret of lead is a rare mineral product of this parish, nevertheless when it does occur, it is generally in a state of great purity. I have several large specimens in my collection at present, which, from their sensible and chemical qualities, approach as nearly to purity as any galena I ever beheld. The sp. gr. of some of it, is about 7·5. Galena is not only found in the pyrites, but it also occurs in seams adjoining the coal.

A seam of this sort was recently discovered in one of the collieries near Elland, from which a tolerable quantity of sulphuret of lead was extracted.

In the parish of Halifax there are several extensive copperas manufactories, three or four of which are in the township of Elland. Each of these is capable of making upwards of 120 tons of sulphate of iron, annually. With one or two exceptions, the beds connected with them are pretty nearly equal in value, being about forty yards long, and thirty broad. The employers, as I have before stated, are in the habit of importing the pyrites from neighbouring collieries, and the formation and quantity of copperas is assisted and increased by scraps of old iron, which they purchase from any suitable source.

Occasionally in fine weather, and when the bed is in proper condition, a large proportion of the pyrites is sprinkled over with a white powder, which rests upon the dross like hoar-frost. This appears to be sulphate of iron apparently deprived of its water of crystallization. In time this salt no doubt would become converted into the peroxide, but so soon as the first shower descends, it is washed into the cellar and vats, where it is no longer subjected to the action of the atmosphere. The rain which falls on the pyritic beds, assisted by the air, tends to decompose the bi-sulphuret, and to form new compounds, viz. cop-

peras or sulphate of iron, and free sulphuric acid. The sulphate of the protoxide of iron thus formed, is dissolved by the superabundant water, and this solution, together with the free diluted oil of vitriol, gradually drains from the bed into a sort of channel or gutter, which conveys it into cellars. At some works, instead of a gutter, the bed rests immediately over the arches of the cellar, each side sloping internally, and thus forming a species of trough with its bottom resting upon the roof, through which the liquor is suffered to drain. To prevent unnecessary loss of fluid, the parts external to the sides of the bed, are puddled. Having been filtered into the cellars, the fluid, which is very acid, remains there along with scraps of iron, until wanted, when it is pumped into large leaden pans capable of containing more than 1600 gallons. In these vessels it is boiled along with scraps of iron for upwards of a fortnight, this space varying however according to the strength of the liquor, and as the evaporation proceeds, additional fluid is pumped into the pan. This operation is continued until the liquid becomes of the requisite sp. gr. which the manager ascertains by weighing a certain bulk of it, as a pint, at which period the free sulphuric acid has united with a sufficiency of protoxide of iron, and the water is fully saturated with the sulphate. When ready to crystallize, one pint of the liquor weighs about 30 ounces.

In place of weighing, some makers set a portion aside in a basin, and according to the amount of salt deposited, decide whether the saturation is complete. The solution is then drawn off into leaden cisterns, and allowed to cool, when large crystals of sulphate of iron are deposited. The formation of these crystals is materially assisted by suspending in the liquor long poles or pieces of rope, to which the salt attaches itself in the shape of elegant oblique prismatic crystals of a beautiful light green color. After the crystallization is completed, the mother liquor is withdrawn, when the metallic salt covering the poles, ropes, &c. is allowed to dry. It is afterwards separated from its attachment by means of a hammer, and placed in a dry chamber, when it is ready for the market. The value of copperas is very trifling, though when the woollen and other trades are flourishing, there is a tolerable demand for it amongst dyers, &c. It is sold at from three to five pounds per ton.

At some establishments, in place of leaden boilers, they have cisterns built of brick work so closely cemented as to hold the liquid. This brick work is puddled externally. Cisterns thus contrived, are about forty-five inches wide, thirty inches deep, and sometimes more than twenty yards long, and calculated to hold an immense quantity of copperas-water. They are open at the top. At one end, somewhat below the level of the cistern, is placed a large fire of coals or cinders, the heat of which passes immediately over the surface of the liquor, and then escapes up a long chimney which rises from the other extremity of the cistern. The tall chimney is to promote a better draught.

The manufacture of copperas, however, is not always so easy as might be supposed, from the manner in which it has been described, and such is particularly the case in this part of the country, where many of the beds are in a poor condition from the want of being replenished with pyrites.

I will now make a few observations on the source of the failures, and how skilfully these have been obviated by the makers of copperas. In doing so, however, I shall be necessitated to extend this article somewhat beyond the limits which I had prescribed to myself at its commencement. Nevertheless, the importance attached to this division of the subject will furnish a sufficient apology.

The first source of error that comes before us is the poor condition of the beds. These, which in some cases have not been renewed for half a century, and which, either the cupidity or inability of the owner, has submitted to a continual course of exhaustion during the whole of that time, are now become incapable of yielding a sufficiency of acid to dissolve the iron, or to protect it from oxidation in the boiling. I have seen several instances of want of success from this cause, where the liquor, when it ought to have yielded a large crop of the sulphate, deposited a pan half full of peroxide of iron, marked here and there with small spicula of the proper salt. In the production of this oxide, two or three causes may have been in operation, such as impurity of the water, or deficiency of acid, or both. It must be remembered that none but rain-water can be employed with safety, for in the vicinity of these works, the spring and running water is itself so charged with peroxide of iron or ochre, &c. that if allowed to flow upon the beds, or into the cellars, it invariably carries a large portion of this powder, &c. along with it, which, after the evaporation is completed, remains unacted upon either at the bottom of the pan or mingled with the crystals. It would seem that a superabundance of acid alone will dissolve some portion of this sediment. Again, the free oxygen present in the spring water may convert some of the iron into peroxide; and what is worthy of greater attention, rain water circulates and filters through the bed more gradually and completely than water from other sources, operating effectually in the decomposition of the dross, and also uniting with a larger share of copperas and oil of vitriol when formed.

The greatest injury, however, arises to the manufacturer when his acid is deficient in quantity, for the longer the boiling is continued, so long and the more peroxide will be

precipitated. This may be explained in two ways, either by supposing that the acid is in some measure decomposed, or that it is insufficient to protect the iron from the action of the atmosphere, thus in both cases allowing of the deposition of peroxide. Again, the acid will dissolve only its proper equivalent of iron.

I believe both causes are here in operation. During the boiling, acid vapours, &c. are evolved.

The copperas manufacturer, after suffering considerably from mishaps of this kind, has at length hit upon a method of remedying the evil. In those instances where circumstances will not admit of his renewing the beds, he is in the habit of adding sulphuric acid, to the amount of some gallons to his liquor, either whilst in the cellar or in the pan. This has the desired effect, and instead of the peroxide which previously annoyed him, he obtains crystals of the requisite quantity and shape. This custom is not generally known, and the makers usually keep it secret, since it would injure their establishment in the opinion of those with whom they deal, because it is supposed that oil of vitriol, thus used, renders the copperas less suitable for dyeing cloth. Why such should happen, I will not pretend to explain. Be it as it may, it would appear that the natural way of making copperas, if the expression may be allowed, is vastly preferable to the artificial. The sort of salt preferred by dyers, varies according to the color sought. Thus where light colors are made, the fine green copperas is requisite; for darker shades, the brown sulphate, which is a mixture of the sulphate of the protoxide with the sulphate of the peroxide. Such might have been inferred from their different chemical properties on solutions of ferrocyanuret of potassium, the sulphate of the protoxide yielding with this agent a white precipitate, and the sulphate of the peroxide, prussian blue. With the brown sulphate, gall-nuts form a deep blue ink. Dyers were a long time in discovering the nature and source of these qualities of copperas. They have, however, now become perfectly familiar with them, and the means which the makers adopt in order to supply their various wants, are very simple. The green consists of the first and best crop of crystals, whilst the brown is formed in the course of a more protracted crystallization of the divided salt, and during the time of its exposure to air in the chambers. After each boiling, a layer of dirt, about six inches deep, mixed with much peroxide of iron, remained at the bottom of the pan. This has to be removed prior to a second operation.

Before concluding my letter, it will be advisable to make a few observations on the methods of applying heat to the pans and cisterns during the evaporation. These vary with the establishment. The original plan, and that, too, followed at some of the oldest, is by means of grates and flues placed under the pan. This method, however, is now becoming obsolete, in consequence of its destructiveness to the boilers, and the great demand for fuel. Added to this, much heat is needlessly consumed, not only by passing up the chimney, but in raising the temperature of a larger quantity of liquid than is necessary. Such manufacturers as are dissatisfied with this process, convey heated air from fires placed at one end of the pan directly over the surface of the liquor, a rapid current being established by the aid of a long chimney rising from the other extremity. This practice has the advantage of keeping up a sufficient evaporation with less expense of fuel, and also of merely heating the surface instead of the whole body of fluid. Again, the pan itself, should it be of metal, is not subjected to a temperature so injurious to the material of which it is formed, viz. lead, nor is the liquor or copperas so liable to be decomposed. A third plan of evaporating has been proposed, and in some places put in effect. This is by making steam or heated air circulate through the liquid by means of a coil of leaden piping. The principle on which it is accomplished is excellent, though not so generally adopted as it will be in time to come.

In conclusion, I may observe that the fumes arising from these manufactures, are somewhat disagreeable, and of course not only accompanied with the evolution of hydrogen, but also of sulphuretted and carburetted hydrogen and sulphurous acid gases. Hence we would look upon them as rather prejudicial to health, if not to animal life. Such, however, is not the result here as regards man, for it is worthy of remark that some of the oldest and most healthy individuals with whom I am acquainted, are those who have been connected with copperas-making during the greater part of their lives. I know one man who is above 80 years of age, and who at the present moment may be considered in robust health. He has, however, always been a most temperate and regular character, and this is true as regards most of the individuals who labor at these places. Neither does the vegetation in the vicinity suffer. The rose and the honeysuckle flourish as luxuriantly under the walls of a copperas-house as they are ever known to do in their native woods. The herbage of the adjoining meadows is equally healthy and abundant. All these facts may be accounted for by the supposition, that either the gases are carried away by the numerous currents, or are too largely diluted to produce their deleterious properties, and not by supposing them to be innocuous, for there cannot exist a doubt that sulphuretted hydrogen is one of the most poisonous compounds with which we are acquainted. Its effects on rats and horses are well known, and though the

latter do not seem to suffer much, yet rats and birds are frequently found dead in and about these establishments, with no other way of accounting for their destruction than by the effects of these gases upon them.

All the buildings and out-houses connected with copperas manufactures, are usually blackened, and as such assume a peculiar and somewhat uninviting aspect.

I am, Gentlemen,

Very respectfully yours,

JOHN S. HILEY, M. B.

ON THE MANUFACTURE OF SULPHURIC ACID FROM IRON PYRITES.

To the Editors of The Chemist.

GENTLEMEN:—

I have no doubt you will acquit me of presumption in taking the liberty of offering, for your consideration, a few remarks on the objections which you raise to sulphuric acid manufactured from iron pyrites, on account of the quantity of arsenic this ore contains, which appeared in THE CHEMIST, of July last.

In the first place, it would be well to inquire why this ore has been so extensively used of late as a substitute for sulphur. I believe the consumption was very insignificant indeed before the KING of SICILY granted a monopoly of the sulphur trade, to a Company of Frenchmen. When he had done this, as a natural consequence the article rapidly rose in price, and would have gone considerably higher had not the manufacturers made use of this substitute, and thereby diminished the consumption of sulphur. The iron ore being very abundant in this country, was speedily brought into use by the large sulphuric acid manufacturer, though not without much trouble and cost to themselves, and consequently checked the rise in the price of sulphur; and had the monopoly continued, no doubt they would eventually have found a supply equal to the demand of the trade. But then there is the objection of its containing so deleterious a substance as arsenic, which certainly appears at first sight a most formidable obstacle, on account of sulphuric acid being so extensively used in the manufacture of many articles employed in domestic and manufacturing operations: but in the article you mention—soda—it seems almost impossible that it could be found, when we consider the great heat to which the sulphate is subjected, along also with carbonaceous matter, in decomposing it for soda—a heat more than sufficient to dissipate the whole of the arsenic it may contain.

But that there are many articles manufactured by the aid of sulphuric acid, which must necessarily contain the poison, I by no means deny, as the contrary is notoriously the fact; but whether we should on this account abandon an article found abundantly at home, for one of foreign supply, where we are evidently subject to the caprice or cupidity of a poor dependent Sovereign, does not seem altogether so plain. Ought we not rather to endeavour, if possible to get rid, at a cheap rate, of the poisonous matter, and thereby preserve the advantages arising from a home supply of an article of such extensive use?

But how could this be accomplished? Much greater obstacles have been surmounted, otherwise our chemical operations could not have been brought to the perfection they have—imperfect as they yet may be. Suppose, however, some such method as this to be adopted: let the gas, instead of directly entering the chamber as it issues from the furnace, traverse a series of pipes passing along the side of the chamber, or if need be, all round before it enters it; would not the gas, by being so much cooled, deposit any arsenic which it might contain before it arrived at the chamber? and, would not the gas, by being reduced in temperature in this manner, the more readily condense into sulphuric acid, and thereby compensate for the loss sustained by the increased expenditure of erecting the leaden chambers? I am persuaded many plans might be adopted for this purpose, but have no doubt I have already wearied your patience, though I hope not to such an extent as may prevent my reverting to the subject at some future time, and shall subscribe myself for the present,

Respectfully yours,

A MANUFACTURING CHEMIST.

Comersal, Aug. 10, 1841.

ADULTERATION OF MOIST SUGAR.

Caution to Poor Law Unions.

BY CHARLES WATT, JUN.

MY attention having been called to the adulteration of moist sugar, by the receipt of a sample of some which had been supplied to one of the Poor Law Unions, I lay before the readers of THE CHEMIST the result of the analysis which I have made, with the view of drawing public attention to an almost unparalleled instance of fraud, and one which I have reason to suspect is very extensively practised.

In former days, persons were content with mixing a little sand with moist sugar, which, although it was robbing the public, at any rate was a comparatively harmless adulteration, because, when the sugar was added to

the liquor to be sweetened, the sand fell to the bottom of the vessel, and was thus easily detected and the party avoided for the future. But now that people are more refined, and that roguery is almost scientifically practised, adulterations have become more heartless, more infamous, and more extensive, and, notwithstanding that our means of ascertaining them have very much improved, they are more difficult of detection.

It is disgraceful to see men endowed with intellectual faculties, intended for far loftier purposes, debasing themselves by trying for the sake of gain to make the lot of the poor more wretched than it already is. If such miscreants have the same treatment meted to them "with the same measure wherewith they have meted to others," how deplorable will be their lot!

The adulteration which is now more particularly under consideration, is that of some moist sugar which was supplied to a Poor Law Union at 76s. per cwt., which is a fair price for a genuine article, and which would have allowed the dealer a reasonable remuneration; but this worthy's cupidity would not allow him to be content with this: he must rob the poor pauper, who at the best of times does not receive too much of the luxuries of life. The wretch who could deprive this class of persons of any portion of what they have allowed them, is a creature whom language is not strong enough to denounce. He who robs a place of worship is a saint in comparison with such a miscreant.

The sugar in question was treated in the following manner: 200 grs. were put into a glass vessel, and cold water was added: the sugar was dissolved, and a white powder remained at the bottom. The supernatant liquor was then poured off, and the powder carefully washed, dried, and weighed. The white powder was then further examined, and proved to be *fecula*,* the weight of which amounted to about 8 per cent. From information which I have obtained on the subject, and from the appearance of the sugar, I am enabled to state that a substance known by the name of potato-meal, or potato-arrowroot, was the article used with which to adulterate the sugar, and as this substance contains only about one-third of its weight of fecula, it is clear that the adulteration must have been to the extent of nearly 25 per cent.

The quality of the sugar is very bad, and although I do not like to charge persons with an act of which I cannot be positive, yet it seems clear to me that there must have been a connivance between some of the parties in authority, or they never would have suffered the poor, under their charge, or the public who placed them there, to be so infamously defrauded.

I feel confident that it is only necessary to awaken the public, and some of the worthy gentlemen who have time to devote to the subject, and take an interest in seeing that the poor are properly taken care of, to the fact that many of the articles supplied to the Unions on contract are scandalously adulterated, for them to devise and adopt some plan to stop such villany, and to secure to the guilty the punishment they so richly deserve.

I cannot conclude without expressing my sincere acknowledgments to those who have so kindly afforded me the information which has enabled me to give publicity to this adulteration, and who have so warmly taken up the subject at the Union in question.

* Fecula is soluble in hot water, but insoluble in cold.

CARSTAIRS' WRITING INK.

We have received a bottle of this ink from Mr. Barton, the proprietor, and cheerfully add our testimony to the numerous others in its favor. We do not recollect ever having used better.

III. PHARMACY, &c.

MEDICAL REFORM.

That the present state of medical education, government, and practice, can no longer be suffered to disgrace the name of science in this country, and that society cannot longer be left unprotected against ignorance, folly, and imposition, nor the educated and enlightened practitioner be cheated of his just rights, and permitted to remain on the same degraded level with the illiterate pretender and fraudulent empyric, must be evident to all who are conversant with the subject, or possessed of common reflection.

The time has now arrived when changes must and will take place: the question therefore rests entirely on the nature of these changes, and the extent to which they are to be carried. During the present session of

parliament, great exertions will doubtless be employed to obtain certain objects in conformity with the notions of such as desire only to advance their own ends, to the injury of all the other classes of the profession and of society itself; nostrums of all kinds will be compounded and made palatable by being disguised in vehicles calculated to deceive the Legislature and induce it to gulp it at once. Exeter Hall will, we doubt not, again ring with Gallipot oratory, and the Solons of the "Association" will frame laws which will make Machiavelli "a dead letter," and the *Code Napoleon* a bye-word of ridicule.

The most unquestionable authority assures us that it is the intention of certain interested parties to use all their exertions and influence to obtain, by a new kind of tact, restrictive measures of Medical Reform, bearing very heavily upon Chemists and Druggists; and therefore, in conformity with our engagements with that body, we are induced to urge them to be vigilant, and to arouse their attention in time, and not to suffer themselves to be made the victims of tyranny, nor listlessly to succumb to the wishes of their enemies; and while we thus call upon them for activity, we assure them that in the hour of need we shall be at their right hand, and that our duty will be neither neglected, nor performed with indifference.

So often have we received the acknowledgments and thanks of that portion of our readers who are engaged in the department of Pharmacy, for the interest we have evinced on their behalf in our columns, that we deem it quite superfluous to make any further remarks on the subject of our being identified with the interests of their body; but we wish to be distinctly understood as confining ourselves solely to these without the slightest reference to, or connection with, any petty twaddlers who may be suddenly seized with a scribbling mania, from a penchant of all others the least suited to their capacity or knowledge. Our subscribers are aware that every number of this Journal, for twenty-one months, bears on the face of it the surest proofs of our priority, and indelible evidences of our strenuous, incessant, and successful labors in that cause, with the justice of which we have from the first been fully satisfied. In the settlement of all differences in the government of the medical profession, we have no fear that Chemists will not conform to any fair and equitable arrangements; but in the mean while, we cannot too strongly recommend them not to relax their efforts, nor to trust their concerns and interests to any societies which, toadstool like, may suddenly spring up. District meetings and petitions, in case of further attempts at encroachment, will do all, and that with tenfold effect.

Our observations from time to time upon the present disgraceful condition of the medical profession, and the still more culpable conduct of a set of men who assume the name of medical practitioners only to degrade it, never, it is obvious, have been directed against such as are qualified by education and science, whether these have been acquired at any recognized college or school, and are sanctioned by any diploma, or those who on the contrary have been self-tutored by the best of all instructors—personal application and industry. Such, to use the language of the late Dr. Geddes, we "should hail as a fellow disciple," even though a member of no chartered body. Let it, however, be understood, we do not intend that any but perfectly qualified persons should be permitted to have the care of health or the power to administer medicine. A graduated scale of education and examination, is all that we are desirous of having established in the respective grades of medical practitioners, commencing with physicians, and descending regularly to chemists and druggists; and that it be made compulsatory on all to qualify according to the rank he intends to take in the profession.

This plan of education and proof of competent knowledge on the part of dispensing chemists, in chemistry, botany, materia medica, and pharmacy, is what we have ever advised, from the firmest conviction of its great benefits to themselves and the required safety and confidence of the public. At present we complain of the deficient knowledge in all ranks, and particularly in that of apothecaries, in which there exists the grossest ignorance, presumption, and disqualification. It cannot, for an instant, be supposed we mean to shield chemists, while we advocate strict examination into the attainments of the other branches; on the contrary, we are satisfied that no one ought to be allowed to deal in medicine, unless he knows the properties and doses of the article he keeps, and the diseases in which they are given. We have a due respect for

the honor, liberality, and advancement of the profession, and these we are confident can never be established, until the ignorant and smattering pretender, and the fraudulent and infamous empyric are driven from its ranks and totally suppressed.

The laws which tolerate such, and particularly the latter, in order to augment the revenue, are a disgrace to the legislature and a civilized community.

Our readers may rest assured, that the interests of chemists and druggists are by no means at variance with the welfare of the other branches of the profession, and may feel satisfied, that while we are exerting our efforts to protect them from the aggressions of the middle ranks, it is perfectly compatible with our duty to conserve the respective interests of all.

Our pledge is with the body of the trade, and not with any societies whose proceedings for the most part, in this country, commence with talk, and terminate with feasting. Like Milton's academy in Aldersgate Street, at best "they produce nothing wonder-working." The trade must be its own protection in those rights which belong to them in common with every other class of tradesmen, and must be on the alert to persevere against the attempts of that portion, which, in order to live, is obliged to combine the trade of the Chemist with the semi-professional rank of the Apothecary.

To render the medical profession efficient, respectable, and entitled to public confidence, it becomes necessary that some measure should pass into a law, establishing a regulated system of medical government in education and practice. The privileges of rank ought to be thrown open to all, if, upon examination by a proper method of testing knowledge, and not by a set of boobies, like apoplectic compounders of lenitive electuary, they are found to possess such knowledge as qualifies them to practise, though they may be totally unconnected with any constituted college or school.

It is easy to shew the worthlessness of these. The College of Physicians, by far the most deserving of confidence, is a sad and powerless piece of machinery: the College of Surgeons, a perfect farce; and the Apothecaries Hall, a place of examination in every thing but medicine and its proper collateral subjects. The claim of societies in general to respect is by no means advanced by the last sittings at Plymouth of the British Association —"The Parliament of Science." If the "collective wisdom" of the high court of Parliament during the session, by its deliberations on the present condition of politics, does as little to relieve the nation, it will indeed deserve greater ridicule than "Mudfog," and draw down more serious consequences; but we have better hopes of this assembly.

In our next number it is our intention to lay before our readers a new and original form of medical education, government, and practice, which, while it will afford the public a complete protection against the dangers of ignorance, it will, at the same time, secure to the well educated and qualified practitioner the just reward of his labours in the acquisition of knowledge, and in the skilful discharge of the arduous duties of his profession.

MEETING OF CHEMISTS AT EXETER.

To the Editors of The Chemist.

Medical Hall, Exeter,
August 16, 1841.

GENTLEMEN:—

Agreeably with a resolution passed at a meeting of the Chemists and Druggists of Exeter, I beg to hand you a copy of proceedings, and to request the favour of insertion in your valuable magazine. By so doing you will oblige the committee.

I remain, Gentlemen,
Your obedient servant,
JOHN PALK, Hon. Sec.

At a meeting of the Chemists and Druggists of Exeter, held at the Globe Hotel, Thursday, 3 o'clock, P.M. Aug. 12, 1841, Mr. KNOTT in the chair, it was

1st, Moved by Mr. JOHN PALK, seconded by Mr. HOOKER, and resolved—

That the thanks of this meeting be given to the committee of Chemists and Druggists of London for their zealous and successful exertions to defeat Mr. Hawes' Bill, which would have abridged our existing privileges, and injured us in the exercise of our business.

2nd, Moved by Mr. EVANS, seconded by Mr. W. A. TANNER, and resolved—

That this meeting fully approves the establishment of the Pharmaceutical Society of Great Britain, and, believing it to be one of great importance, feels bound to promote its interest, and tenders its best thanks to the Council in London for their strenuous efforts in bringing this Society into operation.

3rd, Moved by Mr. GOODMAN, seconded by Mr. PARSONS, and resolved—

That this meeting agree to enrol their

names as members of the Pharmaceutical Society, and that the Secretary be requested to wait upon the Chemists and Druggists of the City of Exeter with a recommendation from this Meeting to adopt the same measure.

4th, Moved by Mr. Trix, seconded by Mr. Visick, and resolved—

That the thanks of this Meeting be given to the Editors of "The Chemist," who have so kindly come forward to advocate the cause and defend the rights of the trade, and that the Secretary be requested to send the proceedings of this Meeting for insertion in their next number, for the encouragement of others to come forward and join the Pharmaceutical Society.

5th, Moved by Mr. Palk, seconded by Mr. Tanner, and resolved—

That the following resolution be proposed for the adoption of those who contributed to the funds now in hand:—

"That the present balance be remitted to London, towards defraying expenses attending the late proceedings to defeat Mr. Hawes' Bill, and also to promote the objects of the Pharmaceutical Society lately established."

6th, Moved by Mr. H. Evans, seconded by Mr. J. Trix, and resolved—

That the thanks of this Meeting be given to Mr. Knott, for the efficient performance of his duties as Chairman.

COUNTRY DRUGGISTS AND THE PHARMACEUTICAL SOCIETY.

To the Editors of The Chemist.

Ashford, Aug. 13, 1841.

Gentlemen:—

As nearly every reader of your columns has something to say concerning this all-engrossing topic—Medical Reform, or the society which it has been the means of calling into existence, perhaps your humble servant may be permitted to make a few remarks *en passant*.

Although the advantages held out by the originators of the Pharmaceutical Society to induce the Druggists in the provinces to join it, may appear to them (the originators) very great, yet, it must be borne in mind, this same country Druggist is, generally speaking, a shrewd calculating sort of personage having a "pretty considerable spice" of the John Bull hanging about him, which makes him always desirous of seeing his money invested in such a manner as to yield a tolerable annual per centage, and the very idea of transmitting two guineas every year to London, in all probability to be no more seen or felt in a tangible shape, is to him a serious piece of business; for, says he, this 2*l.* 2*s.* per annum is equivalent to the interest on 42*l.* placed out at 5 per cent.

From the enquiries I have instituted and the remarks I have heard made by numerous parties in the trade, it seems to be the general opinion, at least in these parts, that if the subscriptions were reduced just one half, i. e. to 1*l.* 1*s*, and 10*s.* 6*d.*, numbers would be induced to become members who will otherwise withhold their names.

The hardest part of the business, however, seems to rest upon the assistants and apprentices. They are politely told, "unless you send in your guinea before the first of July, 1842 (at least so I understand it, notwithstanding the late manifesto), you can never join our society without undergoing an examination, &c., and, in the event of our getting incorporated by Royal Charter, you can never commence business except you have previously been one of our associates!" Very fine all this:—the privileges to be enjoyed by associates may be well worthy the attention of those assistants and apprentices who reside in or near London; but pray, of what possible use will they be to those situated some one or two hundred miles from the "Great City?" They may, it is true, get an occasional peep at the museum, and hear a lecture or two should they be fortunate enough to pay an annual visit to town, otherwise I doubt very much if one in fifty will obtain any actual benefit from his outlay of one guinea per annum.

The foregoing observations embody, as nearly as possible, the train of reasoning into which I am sorry to say scores, aye hundreds, of the country Druggists and their Assistants have fallen, and which will in the end prove exceedingly detrimental to the interests of the Pharmaceutical Society, in the welfare of which I have from the first taken a lively interest, and with all of whose regulations I do heartily concur, save this, not on my own account, for I shall cheerfully contribute my mite towards the support of so excellent an institution, but I do think that the annual abstraction of one guinea from the already too scanty salary of Druggists' Assistants, would be severely felt by many who yet might contrive to lay by 10*s.* 6*d.* for so desirable a purpose.

In conclusion, sincerely I hope that the matter will be taken into consideration by the committee of management, and that this question will be seriously enquired into,—whether more money would not be obtained, (and this it appears is most wanted at the outset) by reducing the subscriptions one-half, than by keeping them up to the sum already proposed.

I am, Gentlemen,
Yours respectfully,
John Fordred.

PROCESS FOR PREPARING A PURE AND CONCENTRATED SOLUTION OF OPIUM, FREE FROM NARCOTINE.*

BY T. AND H. SMITH, CHEMISTS, EDINBURGH.

We are certainly not of the number of those who hold the artificial salts of the active principles of opium in slight estimation, but on the contrary, we feel that their discovery forms a most important and interesting event in the history of pharmaceutical science, and entitles the Chemists, to whom we are indebted for them, to the lasting gratitude of the profession. Nevertheless, as the natural combination of morphia as it exists in crude opium does, and in all probability will, continue to be preferred and used by a great proportion of medical men, it becomes a matter of great importance to obtain a preparation which shall be free from objectionable properties, and approach as nearly as possible to excellence. The following formula for a solution, we submit to the medical profession, by whose decision its title to such a character as the above, will and ought to be decided.

Macerate for twenty-four hours any quantity of opium in as much water as will be sufficient to cover it completely, and press the solution through a cloth; digest again for the same time in a like quantity of water; again press out, and repeat the process exactly in the same manner, till the opium has been exposed to the action of seven waters, when it will be sufficiently exhausted. The waters are then to be evaporated to the consistence of a soft extract, the concentration being finished over the water both to prevent the active principle being injured by too great a heat. Take up the soluble parts with repeated portions of water, filter, and again evaporate to a syrupy consistence. Expose the syrupy extract to the influence of ether, for the purpose of removing the narcotine; after the ether has become saturated, pour it off, and add fresh portions, till on evaporating a small quantity, no solid residuum is obtained. The extract now freed from narcotine is to be heated in a water bath to drive off the ether completely, and digested in alcohol till nothing soluble in that menstruum is left. A large quantity of inert matter will remain, which we have proved experimentally to be quite free from morphia. The alcohol must now be distilled off, and the residuum of distillation dissolved as completely as possible in cold distilled water; a farther portion of inactive pulverulent extractive matter will remain undissolved. The solution after filtration, is now to be set aside for two or three weeks, when a considerable quantity of solid matter will be found settled to the bottom, from which the liquid must be separated by filtration, and evaporated till about 12 oz. are left for every 4 oz. of opium used; filter, add 2¾ oz. of alcohol, and enough of distilled water to make 16 oz. The solution thus obtained, is of a much lighter color than laudanum, and much more fluid; it is also quite free from anything nauseous in taste or smell, the taste being only slightly and not unpleasantly bitter even in the undiluted state. It is also miscible without muddiness with water and spirituous liquors; but of course will be decomposed by all substances which act on the morphia salts, as it contains, if rightly prepared, the full quantity of that principle which an equivalent portion of crude opium would give. This we have proved by precipitating the morphia from the solution, and forming a muriate, when we obtained from a quantity equivalent to 4 oz. of opium, between 3 and 4 drachms of the salt, which was nearly white at the first crystallization, having only a slight fawn tinge, and was perfectly free from narcotine. One of us was as completely narcotized with 8 drops of the solution, as he would have been with about 80 drops of laudanum. Although the solution is so much freed from principles subject to decomposition, it will be found necessary to add the proportion of alcohol recommended, as it will not keep unless this addition be made; its surface, if it be allowed to stand for some weeks, beginning to exhibit some appearance of mould. The quantity of spirit added, however, forms so small a proportion, that the preparation may with perfect propriety be considered a watery solution of opium. An ordinary dose does not contain more than about 2 drops of alcohol, a quantity so minute that it is unnecessary to take it into account. We have also prepared a solution much more concentrated, by evaporating the liquid so far, that every 24 oz. shall contain the soluble narcotic principle of 16 oz. of opium; its dose is from 3 to 5 drops; its consistence is not much greater than that of laudanum, and it is transparent.

A good liquid preparation of opium should, we conceive, be characterized by the following features, and it has been our aim to make as near an approach to them as possible in the above solution. 1. It should not be subject to change or decomposition by keeping. 2. It should be as free as possible from substances inert or hurtful in their nature. 3. The menstruum should have no action in itself which can modify or obscure that of the narcotic. 4. The mode of preparation must not be productive of injury to the efficient principle of the opium. 5. It should be as free as possible from any nauseous taste or smell. 6. It should remain clear and transparent on mixing it with watery fluids; and, finally, be so concentrated as not to interfere with its portability—a point of no small importance, especially to country practitioners, and with a

* *Edinburgh Monthly Journal of Medical Science*; No. VIII., August, 1841.

medicine in such constant and prompt requisition as opium. The foregoing preparations are marked by all these characters, and we therefore consider them entitled to a place among the many other useful preparations of opium. A very fine watery extract of opium may be obtained by concentrating the pure watery solution at the heat of a water bath to the consistence of a pilular mass. A similar extract was prepared by Robiquet, but not quite so completely free from impurities. Two pounds of opium yield 12·33 oz. extract, so that a grain is equal in power to 2·59 grains crude opium, being about twice and a-half its strength.

ON CERTAIN ANTHELMINTICS IN USE IN ABYSSINIA.*

BY DR. AUBERT.

Dr. Aubert, who has resided some time in Abyssinia, states, that the whole medical practice of the natives consists in the employment of three indigenous vegetable anthelmintics, called Cusso, Bisenna, and Abbatsjogo; and that tænia is so common among the inhabitants as to be considered almost natural. Bruce remarked, that almost all Abyssinians were affected with ascarides; but as the Abyssinian word applies to either species, and Bruce was not a physician, it is probable he confounded the two, especially as the Cusso, which he praised as a remedy against these worms, Dr. Aubert finds to be used in tænia.

The Cusso is the *Banksia Abyssinica* of Bruce, the *Hagenia Anthelmintica* of Willdenow, one of the species of the genus *Saponaria* of Linnæus. M. Kunth, an able botanist, has recognized the flowers as a new genus of the *Rosaceæ*. About two drachms of the flowers in powder are taken in an electuary of honey, and ordinarily in twenty-four hours the patient passes the worm, but without purging. The whole of the worm is rarely expelled; but the patient follows his usual occupation, and, after a time, as the medicine is not unpleasant, and does not cause griping or purging, the dose is repeated. Dr. Aubert became a subject of tænia whilst in Abyssinia, and by taking aperient medicine after the Cusso, he completely relieved himself of it. The Bisenna is a species of conifera, much resembling the *Juniperus Virginiana* of Linnæus. The pulverised bark is employed, but not so generally as the Cusso, as it causes irritation, colic, and in some cases enteritis. The Abbatsjogo resembles the *Ixia bulbocodium* of Linnæus. It is less employed than either of the former species.

* *Bulletin de l'Academie Royale de Médicine*, Mars 15, 1841, and *British and Foreign Medical Review*, July 1841.

CLINICAL REMARKS ON TWO HUNDRED AND SIX CASES OF TAPE-WORM.*

BY DR. WAWRUCH.

During the period of twenty years, 206 patients affected with tape-worm, were admitted into the clinical wards of Dr. Wawruch: of these, 71 were males, 135 females. The oldest patient was fifty-four; the youngest three and a half years old; the greater number ranged between the ages of fifteen and forty. On the predisposing causes of tape-worm the author is able to throw little or no light. A great majority of the patients came from a particular district, and diseases of the abdominal or dermal systems in early life, seemed to have some influence. Thus, 43 patients suffered under ague; 20 under gastro-intestinal disease; 16 under typhus; 10 from herpes; 41 from tinea capitis; 42 from itch; 8 from scarlatina; 13 from measles; 2 from chronic nettle-rash.

In the female sex, the author remarks that the presence of these worms was almost always accompanied by some derangement or anomaly of the menstrual secretion, generally consisting in a late appearance of the discharge.

SYMPTOMS.

Some patients suffered very little, and were unaware of their being affected, until a portion of the worm was discharged; in other cases, the symptoms were better marked; those constantly observed were,

1. A dull pain in the forehead, with vertigo, and ringing in the ears.

2. Troubled sight, with a bluish circle round the eyes; œdema of the upper eye-lid; dilated pupil; rolling of the eye-balls; various disturbances of vision, as double vision, muscæ volitantes, &c.

3. Frequent changes of colour; loss of appetite, interchanging with voracious hunger; and a taste for certain substances.

4. Foul breath; earthy taste in the mouth; salivation; nausea and vomiting of a watery fluid towards morning.

5. Itching of the nose, anus, or vagina; grinding of the teeth, particularly during sleep.

6. Enlargement of the abdomen; rumbling of the bowels; a pinching, biting feel about the navel, with the sense of a foreign body moving in the intestines, especially towards morning; disappearance of those symptoms on taking warm broth, &c.; diarrhœa interchanging with constipation.

7. When the disease is of long standing, melancholy, and a great number of nervous

† *Medicinische Jahrbücher*, Feb. 1841, and *Provincial Medical and Surgical Journal*, July 10, 1841.

derangements; loss of some sense, partial or general convulsions, epilepsy, chorea, &c.

8. The most certain sign is the discharge of a portion of the worm, which may occur without any evident cause; occurs during some disease, as typhus fever, &c.; or is the effect of remedies.

TREATMENT.

The same method of treatment was adopted in all the 206 cases, except where the constitution of the patient, or some other particular circumstance, rendered a modification necessary.

As a preparatory step, all the patients took a laxative decoction, with sal ammoniac, for three, four, or five days, and ate nothing but weak soup thrice a-day. In eight cases, the worm was expelled by the mere effect of continued abstinence. The anthelmintic remedies employed were, castor oil, and the powdered root of the male fern. From one to two table-spoonfuls of the oil were given as a dose, alternately with one or two drachms of the powder twice or thrice a-day.

Enemata of oil and milk were frequently thrown up, to attract the worm towards the large intestine, and it was observed that the effect of the drastic was always most sure when given a certain time after the last dose of fern, than at once. The drastic purge employed was composed of equal parts of calomel, gamboge, and sugar, two to eight grains of each for a dose. In many cases a single dose brought the worm away, but in others, three to six doses were required. The period at which the worm was discharged was very various. In eight cases, as has been already remarked, it was expelled by the mere effect of hunger; in 13 cases, by the anthelmintics alone; in 11 by the first, in 14 by the second, and in 15 cases by the third drastic purge; and, generally speaking, it was expelled within one to twelve hours after the last drastic. In a few cases, two, three, four, (and in one) twelve days elapsed after the last purge, before the worm was expelled. The tænia is not exclusively a *solitary* worm, for in nine cases there were two worms, of different ages and development; in two cases three worms. In one very remarkable case, four worms were discharged, and this patient still suffers from the complaint. Of the 206 cases, only 26 had a relapse; twenty of these came twice, five thrice, and one of them four times to the hospital. Some came in two to four months; two in nine months; two in a year. Generally speaking, the patient may expect to be entirely freed from his disease, if he pass ten or twelve weeks without discharging any remnants of the worm.

LARTIGUE'S GOUT PILLS.*

M. Bouchardat proposes the following formula for preparing Lartigue's pills:—

Compound extract of colocynth	20 grammes
Alcoholic extract of colchicum seeds	1 ,,
Alcoholic extract of digitalis	1 ,,

Make an homogeneous mass, which may be made into pills of 15 centigrammes.

COMPOUND EXTRACT OF COLOCYNTH.

Pulp of colocynth	185 grammes.
Purified extract of aloes	370 ,,
Bruised scammony	125 ,,
Cardamoms	30 ,,
Hard soap	90 ,,
Alcohol at 25°	4 quarts.

Macerate the colocynth pulp for three days in the spirit of wine. Strain the liquor, and add the aloes, the scammony, and the soap; evaporate to a proper consistence, and add the cardamons in fine powder at the close of the operation.

TESTS OF ARSENIC.

In a recent case of suspected poisoning which occurred to a lady of the name of Rawle, residing at Newport, we find the public prints reflecting upon the uncertainty of the tests of arsenic, in consequence of the failure of Mr. Herapath in detecting the presence of any. We may here fairly enquire what evidence is there, that any has been taken, when none is found? Are there no other poisons except arsenic? We have too much reliance on the accuracy and researches of such men as Orfila† and Dr. Christison in matters of this kind, to condemn the tests of arsenic upon such flimsy grounds as have induced the press in this case to decry them. In almost every case where this poison has been taken, and death has followed, it may, with very little difficulty, be detected if proper caution be employed; but we fear that in most cases, it alone is sought for, and when not found, the case is abandoned as one of doubt and uncertainty, and no other substance is searched after.

In investigations of this nature too much caution cannot be observed in order to set the mind at rest, and further the ends of justice.

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* *Journal de Chimie Medicale*, May, 1841.

† The minute portions of this substance detected by this eminent chemist, who has discovered that it exists naturally in animal bodies, is a complete refutation of the fallacy of tests.

STRENGTH OF HYDROCYANIC ACID.

To the Editors of The Chemist.

GENTLEMEN:—

Your correspondent, J. F., in asserting the *awful responsibility* attached to the dispensing chemist, seems to lose sight of the duties connected with his calling, and in which his responsibility alone consists. *Imprimis;* that of faithfully abiding by the very letter of the prescription, unless he detect error in the same, which it would undoubtedly be his duty to avoid confirming; and, *secundo*, in strictly adhering to the use of articles prepared according to the existing pharmacopœia, except the physician orders to the contrary, whereas, in the supposed case there would be a flagrant departure from the formulæ, which are correct.

I would ask, what right has the dispenser to substitute Scheel's acid for that of the pharmacopœia, in either case, especially in the former, where the medicinal strength (i. e. the diluted) is expresly ordered? Yet your correspondent supposes the substitution of the strongest medicinal preparation used, in defiance of this explicit direction, which would be to commit a gross error.

The pharmacopœial preparation is the only one authorized by the College, and as such, it is the article we are lawfully bound to employ when the administration of none other is indicated. Vide the order in council prefixed to the pharmacopœia.

The above is equally applicable to both cases, but should it be thought that the inutility of the dose requires that the latter should not be so summarily disposed of, I beg to state that it is usual, when medical men are desirous of Scheele's being employed, to write Acid. Hydrocyan. (Scheelei); and I believe it is generally allowed, not to be the province of the chemist to canvass the propriety or utility of the prescription which he is called upon to compound, as it is not to be supposed he can be familiar with the peculiar circumstances under which the same was written; neither is it for the dispenser to question the intention of the physician. I believe J. F's queries, as to "what means we have of distinguishing which ought to be employed?" and, "does the physician direct us?" &c., are sufficiently replied to; and further beg to observe, it is not compatible with the object of a pharmacopœia to distinguish between the relative proportional strength of the various preparations of manufacturers. The blame which your correspondent has attached to physicians generally, and to what he is pleased to call our "mutilated life and death pharmacopœia," it will be seen, lies at his own door; and should injury arise from such an occurrence as that supposed, it would be entirely attributable to the dispenser.

J. F. is referred to Dr. Paris's Pharmacologia, page 78 to 82; also to his appendix of the eighth edition of that excellent work, for further enlightenment on this subject.

I have the honor to be,
Yours respectively,
M. P. S. G. B.

FIELD MUSHROOMS.

PERSONS at this season of the year cannot be too cautious in the choice of mushrooms. Yesterday afternoon, a family named Harper, residing in Berwick street, Soho, nearly lost their lives by eating too freely of some stewed mushrooms, which in the course of the morning had been purchased of a country lad, who was hawking them in a basket about the streets, for sale. Shortly after eating the same, they were seized with violent retching attended with choleric pains in the stomach, which, had not medical assistance been promptly procured, would most probably have terminated fatally.

Besides several poisonous "fungi," there is a variety of the tuber, which, although an innocuous catsup may be made from them, are dangerous to be eaten, being highly indigestable, and apt to swell in the stomach, producing very painful and dangerous consequences.

The best way to test the quality of mushrooms, is to introduce a silver spoon, or a new shilling or sixpence, or an onion, into a vessel in which mushrooms are seething; if, on taking either of them out, they assume a dark discoloured appearance, the circumstance denotes the presence of poison existing among them; if, on the other hand, the metal or onion, on being withdrawn from the liquor, wears its natural appearance, the fruit may be regarded as genuine, and of the right sort. —*Correspondent of the Times*, Aug. 10, 1841.

SPURIOUS OPIUM.

To the Editor of The Times.

SIR:—

You will be conferring a favor on the medical profession, if you will permit me, through the medium of your valuable journal, to expose a most gross and flagrant imposition which has been, and for aught I know to the contrary, is still practised on them.

A young man of respectable appearance, professing himself a drug broker, called on me a short time since, and produced for sale a quantity of opium at 10*s.* 6*d.* per lb.; being surprised at the cheapness of such an article, I suspected all was not right, and interrogated him closely on the subject. He, in reply, said his name was B——, and represented himself as a clerk in the employ of Mr. G——n, who was in the habit of disposing annually of accumulated samples, at an immense sacrifice. Being won by this plausible tale, I purchased nearly two pounds

from him, and as it is a practice with me to submit my drugs to their usual tests before employing them, I did so with these samples, and very fortunately so, both for my own credit and the safety of my patients, for they turn out to be a heterogeneous compound of the vilest trash, possessing scarcely any of the active principle of this drug. I have deposited a sample with Messrs. Evans and Lescher, who are engaged in a series of experiments upon it, intending to bring the subject before the Pharmaceutical Society, at their next sitting. On making inquiries, I find that I am not the only one that has been duped, that such a person as G——n is not known as a drug broker, and that the whole turns out to be a gross fabrication of this hopeful scapegrace.

I have the honor to remain, Sir,
Your obedient Servant,
G. B. Childs, M.R.C.S.L.

Wood Street, Cheapside, Aug. 6, 1841.

ON THE EMPLOYMENT OF CHERVIL IN MEDICINE.*

Chervil has been used in medicine, in cases of contusion, swelling of the breasts, as an application to wounds, in glandular affections, in phthisis, dropsy, and in cutaneous disorders. M. Charbrely has recently employed it in decoction in acute conjunctivitis. He speaks highly of its use, and mentions several cases in support of its efficacy. He simply used the decoction in repeated fomentations of the diseased eye; it is probable that it must be dropped between the eye-lid and the surface of the globe of the eye.

SYRUP OF SULPHO-TARTRATE OF QUININE.†

R. Crystallized sulpho-tartrate of quinine	15	gram.
Distilled water	45	,,
Syrup at 35°	300	,,

Dissolve the salt of quinine in the water, and add the syrup, which will contain, per ounce, 24 grains of sulpho-tartrate of quinine.

EMPLOYMENT OF TANNIN IN IMMODERATE PERSPIRATION.

BY DR. CHARVET.

Dr. Charvet speaks highly of the employment of tannin in the profuse sweats to which persons labouring under disorders, especially phthisis, are liable. He mentions several facts in support of this mode of treatment: he uses this substance under the form of pill, in the dose of 2½ to 10 centigr. in 24 hours, combined with a little opium, which neither impedes nor assists its action.

Dr. C. prefers this substance to acetate of lead, which, under certain circumstances, has produced bad symptoms, and to white agaric, which often exerts a prejudicial action on the digestive tube.

* *Journal de Chimie Medicale*, July 1841.
† *Idem.*

TO CORRESPONDENTS.

A Subscriber will find a good receipt for an indelible ink in an article by Mr. Coathupe, in *The Chemist*, No. VI. Vol. I. p. 173.

An Assistant, Edinburgh.—The solution of cochineal is the best: we advise our correspondent to fill a number of phials with the solution, and to add the muriate of tin in different quantities to each, until he obtains the requisite shade.

Constant Reader.—It should be "Precipitated Calomel."

Mr. Horne.—Tartaric Acid.

A Constant Subscriber.—A solution of bichromate of potassa, will, we think, present all that our correspondent desires.

N. N.—There is; it is not permanent.

A Member of the Pharmaceutical Society had better apply to the Secretary of that society for the information he requires.

The Assistant had better write to the Secretary of the Pharmaceutical Society. Turner's, Brande's, or Noad's Chemistry; Pereira's Materia Medica; Brande's Pharmacy; and Burnett's Botany.

E. G. How.—Apply to our Publisher.

TO SUBSCRIBERS AND ADVERTISERS.

The Chemist, for the present year, forming Volume Second, will be completed early in December, when our Subscribers are recommended to complete their volumes without delay, to prevent disappointment. The Publisher will give full price to any gentleman possessing numbers I, III, and IV. of Vol. I.

Advertisers are again reminded of the value of the cover of *The Chemist* for all Works, and other Advertisements connected in any way with the Medical and Pharmaceutical Professions.

Nota Bene.—*All Communications and Books for Review must be addressed, "To the Editors of The Chemist, care of Mr. Hastings, Publisher, 13, Carey-street, Lincoln's Inn Fields, London." Communications must be pre-paid, and sent before the 15th of each month; Books for Review, before the 10th.*

PRINTED BY STEWART AND MURRAY, OLD BAILEY.

THE CHEMIST.

I. CHEMISTRY.

BRITISH ASSOCIATION. ELEVENTH MEETING.—(Concluded.)

Section B.—Chemistry and Mineralogy.

President,—Dr. Daubeny.—Vice Presidents—Prof. Daniell, and Col. York.

Tuesday, August 3.

I.

"On the Radical of the Kakodyle Series," by Prof. Bunsen.

The method recommended as being the easiest for procuring kakodyle in a pure state is the following:—

Chloride of kakodyle, carefully freed from the oxide by treatment with strong muriatic acid, is allowed to stand some time over chloride of calcium and quick lime, to remove the water and all excess of acid. It is then introduced into a distillatory apparatus carefully filled with carbonic acid, and containing some slips of clean sheet zinc. Any of the metals which decompose water will answer, but zinc is the best. It is probable that hydrogen or carbon would produce a similar decomposition with suitable modifications of the apparatus. The vessel is then hermetically sealed, and the mixture of zinc with the chloride is exposed in a water bath to a temperature of 212° Fah. for some hours. When the decomposition is complete, a white saline mass is formed, which melts into an oily liquid between 240° and 248° Fah.; while the tube is still hot, the point of the tube leading into the condenser is dipped below the surface of boiled distilled water: as the apparatus cools, the water rises into it. The tube is hermetically sealed; the water dissolves chloride of lime, leaving the excess of zinc and the kakodyle which falls as an oily liquid to the bottom—this is rectified twice or three times in vessels filled with carbonic acid as before; the water being afterwards removed by chloride of calcium in the usual way. Thus obtained, it is a colourless liquid, transparent and of a high refractive power, in appearance and odour much resembling the oxide of kakodyle, and ignites instantly on being brought in contact with air, giving off water, and carbonic and arsenious acids.

II.

"On the Production of Sulphuretted Hydrogen by the Action of Vegetable Matter on Solutions containing Sulphates," by E. Lankester, M.D.

Dr. Lankester stated that observation had enabled him to detect sulphuretted hydrogen in water, by the presence of some peculiar animalculæ which caused a red deposit—he found it in lakes and springs near Askerne, in the dropping well at Knaresborough, and other places situated on or near the great tract of magnesian limestone in that district. He then enumerated a series of experiments, instituted with a view of investigating the source of sulphuretted hydrogen, from which he came to the conclusion, that it arose from the decomposition of the sulphates, in contact with vegetable matter. In allusion to Prof. Daniell's experiments on the waters from the African coast, the author stated, that Dr. Clem has recently detected sulphuretted hydrogen to a very considerable extent in the sea waters of the British coast. Dr. Lankester is of opinion that the elements for the production of sulphuretted hydrogen are as abundant around our own island, as on the coasts of Africa; but it is not developed to so great an extent from the want of a high degree of heat.

Dr. Daubeny remarked, that running water soon lost its sulphuretted hydrogen, and the confervæ grew at Knaresborough immediately the waters were, by exposure, freed from this gas, thus distinctly marking its presence or otherwise.

Mr. Robert Hunt stated, that he had detected sulphuretted hydrogen in considerable quantities, in the water issuing from the clay slate of the bottom level of the Consols Mines, and also in some other samples of water collected in the deep Cornish mines.

III.

A paper was read from Dr. R. D. Thomson, 'On the Composition of Crystallized Diabetic Sugar.'

Mr. Booth made a communication on the subject of Spontaneous Combustion.— The author enumerated a great variety of vegetable and animal products which possess the property of passing spontaneously into combustion. He also exhibited a table showing the number of fires occurring in London, in a given time, particularizing the different trades, and, where it was possible to obtain the information, the causes of these fires.

The destruction of the *Talavera* being mentioned, Mr. Robert Hunt stated that he had been engaged, at the request of the solicitor to the Admiralty, in the inquiry which followed this fire, and had forwarded to the Admiralty two reports, which, to his own mind, most satisfactorily referred the fire to the spontaneous ignition of masses of oiled oakum, anti-attrition, oiled and painted canvas, sawdust, &c., which had been allowed to accumulate in a large bin, on the edge of the dock, immediately beneath the roofing under which the ship lay.

Mr. N. Hearder adverted to the spontaneous explosions of iron bomb-shells, instances of which had recently occurred, and mentioned some experiments which he had performed a few years since, on combustion in vacuo, but which, in consequence of an accident which deprived him of sight, he found himself incapable of continuing with accuracy. They related to the effect of diminished pressure in modifying and restraining combustion. The following are some of the experiments which he detailed:—Different mixtures of chlorate of potash, with loaf sugar, sulphur, arsenic, black sulphuret of antimony, &c., were successively introduced into the receiver of an air pump, together with a small vessel of sulphuric acid. The receiver was exhausted, and, by means of a sliding wire through the cap, a bunch of thread was made to touch first the sulphuric acid, and then the chlorate mixture, but in no case could any combustion be effected. A slight effervescence, and, in the dark, very faint scintillations of light were perceived. The experiment was reversed by throwing the mixtures into the acid, but without combustion. Into a champagne glass about one ounce of nitric acid was poured, and a few grains of chlorate of potash and phosphorus were then thrown in; in a few seconds brilliant flashes of light were produced under the acid; but on placing the glass under a receiver, and exhausting, the flashes ceased after a few strokes of the pump. On re-admission of the air the flashes again appeared, and so on alternately. In order to vary the experiments, Mr. Hearder contrived to keep a piece of platina wire in vivid ignition by a powerful galvanic battery, which, when the receiver was exhausted, was brought into contact with gunpowder, but without its being inflamed. The portions in contact with the wire fused and adhered to the wire, and were seen in a state of ebullition at a red heat on the wire, and appeared gradually to evaporate. During this process a dense brown smoke was observed to fall at the bottom of the receiver. Air was then admitted, and as soon as the barometer gauge indicated half the pressure of the atmosphere, the gunpowder inflamed with a very faint flash. The experiment was repeated, but nitrogen gas was admitted instead of atmospheric air, and the inflammation took place when one-fourth of the capacity of the receiver was admitted. A mixture of chlorate of potash and arsenic inflamed on re-admission of air, when the mercury had fallen two inches. Chlorate of potash and sulphuret of antimony required the admission of a much larger proportion of air to produce inflammation. Whatever combustible mixtures were used, the inflammation was always effected with the admission of a much less quantity of nitrogen than of atmospheric air. In experiments with antimony and arsenic, iron wire was used, instead of platina, the latter being always destroyed by the inflammation of these substances. Mr. Hearder considers that the restrained action thus observed arises from the extremely attenuated form which the gaseous matter assumes at the moment of its formation, since it must necessarily expand over the whole receiver, by which means its concentrated action upon the other ingredients is prevented.

Mr. Prideaux exhibited a specimen of a compound of oxide of lead with empyreumatic oil, produced in the distillation of wood, and forwarded by Mr. A. Tunstall, of Neath.— This compound, which had much the character of diachylon, was entirely soluble in boiling water, from which sulphuric acid separated the lead, and the oil floated on the surface.

Mr. Tweedy mentioned, that about six months ago, a specimen was shown to him by a respectable mineral dealer at Truro, of what he called molybdic silver. As, however, it was of a very fusible character — melting before the blowpipe readily, even in the flame of a candle—Mr. Tweedy conceived that bismuth must enter largely into its composition, and sent a small specimen to Mr. Prideaux for examination, who ascertained that it was nearly pure bismuth, he believed native. Some further specimens satisfied Mr. Tweedy

of its being natural, and not artificial, and of its great value. It was found in a mine near Truro, in a large unproductive sparry lode, and only in one spot.

It is observed by Dr. Johnson, "that it is better to see smoke brightening into flame, than flame sinking into smoke." This is a truth which none will dispute, and we should be glad indeed if we could bear our testimony to the illustration of the former part of the sentence, rather than to the sad, but strict, exemplification of the latter, in the recent meetings of the "British Association for the Advancement of Science."

The early sittings certainly gave the most promising indications and assurances of some extraordinary revolutions in science: they were composed of a galaxy of talent which dazzled all Europe, and gained the institution the name of the "Parliament of Science."

On the occasion of its meeting in Bristol it contained among its members the greater part of those who are celebrated throughout Europe, for their knowledge and discoveries in every branch of science. France, Germany, Italy, and other countries contributed their aid to sustain the dignity of the occasion, and to enlighten the world with their researches.

To the Association at this period the eyes of all nations were directed as to a centre from which would radiate the light of truth and knowledge—the surest source of advancement in the sciences, and arts, and the general benefit of mankind.

That the objects for which this Institution was founded are good, cannot be doubted; but in order to fulfil them it is necessary that the elements of which it is composed should be good also;—that they should be chosen from the *élite* of each profession, and not from the "οι πολλοι:" due attention to such a selection, with respect to all who are allowed to take part in its proceedings, would have ensured the prosperity of the Association in the same ratio as the neglect of it has hurried its decline and degradation.

We do not, however, intend to assert that very eminent individuals do not take part in the proceedings; but at the same time it cannot be denied that the instances are rare, and that for the most part the papers are read by persons by no means holding any distinguished rank in their departments.

From the meeting at Liverpool, to that of the present year at Plymouth, there has been a progressive and palpable falling off; and if some extraordinary exertions are not speedily adopted, we shall see the places of Gay Lussac, Faraday, Liebig, and Whewell occupied by mere tyros, who hope rather to take light from, than add it to, the Association, and we shall have to witness such a change in it as will compel us to admit with regret, "stat nominis umbra." That this decline in the interest evinced by the higher ranks is dependent upon some disapprobation of the management, cannot be doubted. To many, the feasting, the automatic promenading in assembly rooms at night, and the heterogeneous collection of all sorts, are sufficient reasons for their withdrawal from the meetings.

Considering the high position taken by this body, and the sounding title it at first acquired, we may ask how has it answered the expectations formed of it by the public? Let us, for instance, take the recent meeting at Plymouth, where, through some bungle, or what is worse, downright inability of the local profession, no medical section was formed, and that in a town where most especially are such ample opportunities and advantages for medical practice. But to come to the Chemical Section: is it worth while taking persons from all parts of this country and the Continent, and the expenditure of some thousands of pounds per annum, to hear read a few papers of the humblest pretensions? We do not mean to deny their relative merit; but when it is considered that they are all that are brought before the scientific of Europe, they are indeed worthy of the unenviable cognomen of "Mudfog," given to the association by the late Theodore Hook.

To give any critical account of the various papers, would be impossible as regards our space, and worthless to our readers. The first paper, that of Mr. R. Hunt, "On the Influence of the Ferro-cyanide of Potassa on the Iodide of Silver producing a highly sensitive Photographic preparation," is decidedly of importance to the beautiful art of photography. The one by Mr. De Moleyn, entitled, "Some Researches on the Development of the Electrical force," is perhaps the most valuable of any one read to the Association. That by Mr. E. A. Parnell, "On some Instances of Restrained Chemical Action," is likewise an instructive communication; as are also those

of Dr. Daubeny, Mr. Fownes, Mr. Gurney, and Mr. Prideaux: yet let any one but reflect, that they are the productions of a society meeting only once in a YEAR, and compare them with the papers read every WEEK, before the Academy of Sciences, at Paris, and he cannot fail soon to acknowledge that this body, with all its lumbering machinery, is a perfect farce. What would such men as Davy, Berzelius, Dalton, Priestley, Dumas and Wollaston think, to be obliged to travel some hundreds of miles to hear such juvenile productions?—for, who can deny that they are such, when contrasted with the researches of these men?

We may now ask, what has this Institution done for the advancement of science, which would not have been done without its aid? Are we to suppose chemists so culpably idle, as not to work for reputation unless they have the opportunity of collected meetings before which they can display their talents, and that this mere gratification of the weakest of puerile vanities alone urges them to exertions?

We greatly fear that the rewards, too, are subjected to great abuses,—that anything like fair play is not to be expected, much less granted; in fact, that all who are not so fortuitously situated as to have any intimacy or connexion with the committee, stand but little, if any chance; in short, that the business is what in vulgar language is termed a "job."

This migratory flight of unfledged philosophers, in its wanderings, seems to have shunned Manchester and London, as a pestilence, (query, from fear of ridicule?) until we suppose they are obliged, at last, reluctantly to venture, in the hope of recruiting their lost strength.

They are not like the wise men of old, who were to be found in the East; they, on the contrary, begun their lucubrations in the North, and are now getting from the West to the North again, after fluttering about like a moth in a candle, and we greatly fear to the same fate—destruction. We have often wondered that they have not added a gastronomic lecture, and also one of *soirées* and *conversationi*, as we are sure they would tend greatly to revive the expiring state of the Association, and be so much in accordance with the feelings of the greater part of the members. We would recommend the former to include the most accurate statistical accounts of the provender of each particular district visited by them: this plan would be of use in furnishing the public with the qualities of the various bills of fare of these places. In Yorkshire, for example, we should find certain characteristics—cakes, hams, skate, &c. In Scotland, cod and Finnon haddies; in Ireland, mountain-dew and potatoes. What are the peculiarities of the Manchester market, we are not quite certain, except fine salted rounds of beef, baked instead of being boiled, and heads of celery, under the weight of which a porter would bend, added to as much of the real good "cratur" as you please, after a one o'clock dinner. The corporation of Manchester will, no doubt lend the society its aid in this section.

The soirée Section should contain an account of the male and female aristocracy of the neighbourhood, and we can bear our testimony to the superiority of the "Lancashire witches." The elegant displays at the assemblies in the evening are not behind any part of the kingdom. Like all such meetings, an impertinent ogling fop here and there may disturb the harmony or seriousness of the company; but else, there is nothing that can be noticed which presents any local disadvantage or disparagement to the visitors. Over this Section we should rejoice to see Mr. George Cruikshank elected president, whose delineations of human nature, from the highest state of refinement to the lowest grade of ignorance, vice and depravity, will be handed to the latest periods of time, and ever be viewed with instruction and delight by persons of all ages.

In conclusion, we may observe that the association must, it is evident, speedily change its movements and management, or it is too certain that its days are numbered, and that these changes, to be effective of good, must be directed to matter as well as manner. Under such alteration, we should have some hope of seeing its prospects of improvement amended; but continued in its present state, we cannot fail to observe its decline, nor to predict its rapid extinction.

ON THE COLLIERIES OF THE PARISH OF HALIFAX, AND THEIR CHEMICAL AND GEOLOGICAL RELATIONS.

To the Editors of The Chemist.

Elland, near Halifax, Sept. 8, 1841.

GENTLEMEN:—

I cannot refrain from supplying your Journal with another article, entitled "The Collieries of the Parish of Halifax, and their Chemical and Geological Relations." The subject is an engrossing one, and I have reason to believe will be read with considerable pleasure by many in this neighbourhood, who feel interested in the success of your periodical. I will render the paper as concise as possible, but should it extend further than is my present purpose, I trust you will pardon the freedom I may seem to have taken with you.

For a long series of years, the numerous shafts in this parish have served to afford employment to a large number of the humbler inhabitants, and this may be explained by the fact, that extensive strata of coal abound in several of its townships. The principal of these are North Owram, South Owram, Elland cum Greetland, Hipperholme cum Brighouse, Overden, and Shelf. The area of these six townships somewhat exceeds 18,123 English statute acres, and since the whole are of a most uneven character, several of the hills too, being rich in coal, it can be matter of no surprise that so much of this article of every day consumption should be mined amongst us. At the present period nearly 800 individuals are employed in the coal mines of the parish of Halifax. The largest portion of coal lies to the east of the river Hebble, which part of the parish includes the townships of North Owram, South Owram, Shelf, &c. Towards most of the valleys formed by the different hills, the coal beds shelve off, so that in the bottoms none is found.

The numerous streams which course these valleys, would appear to have in the lapse of ages, swept away the coal and the other strata resting upon it, so that from the sides of several of the hills the various formations, from below the coal upwards, are seen jutting out one above another in a most regular manner, inclining however considerably backwards as you approach their summits. Many of these eminences have an appearance peculiar to themselves; for being of an argillaceous nature, the perpetual decomposition of the clayey matter by atmospheric agencies, gives to them a rotundity and smoothness, differing considerably from the vast projections, or long and sharp ridges of quartz which characterize several other portions of the parish.

These elevations abound in excellent stone of a slaty kind, which rests superficial to the coal in three distinct measures, termed the upper, middle, and lower beds. These are respectively about half a yard, one yard, and from three to four yards in thickness, and are separated from each other by strata of clay and shale, of which that between the upper and lower bed is in some places three yards deep. The first bed, which is sometimes wanting, is only calculated for field walls, the second for flags and roofing, and the third, which is by far the best, for the heavier and more durable purposes of masonry. From the quarries of North and South Owram, vast quantities of stone are forwarded to London, to the Continent, and to America, where it is in tolerable repute.

In those valleys where coal is not found, the red sandstone rock may be here and there seen peeping above the surface, which circumstance at once relieves us from the idea of finding coal, and considerably strengthens the opinion that the strata once resting upon it, have been, by some agency, carried away. In others of the valleys, formations are met with nearly allied to those of the hills which surround them, thus proving, either that in some extraordinary convulsion of nature, the hills here have been upheaved, or those plains composing the valleys, depressed. Both movements have some foundation in truth. That convulsions of an extraordinary character have once visited this parish, is abundantly shown by the numerous remarkable faults which have from time to time manifested themselves, both during extensive excavations for stone, and in mining for coal. Of the former, there is a remarkable example in the cutting at Ainley-top, near Elland, and of the faults in coal-mines, there are few colliers in this parish who have not had reason to complain. At Ainley-top, the strata in certain points, are thrown completely out of their place, and instead of continuing united with the rest, they have their edges pointing directly upwards, thus fairly disjointing themselves from the nearly horizontal strata of which they once formed a part. In some places, instead of being horizontal or perpendicular, like the example just alluded to, they incline at an angle of 45° either to the north or south, east or west. Similar instances are continually occurring in collieries, and in addition to this, the strata, though sometimes preserving their horizontal position, may be considerably raised or sunk.

With these preliminary observations, I will now proceed to consider the subject of the collieries. The number of these at present in active operation exceeds seventy. Formerly however they were not so numerous, though in all likelihood more profitable. The coal itself is not of the best quality, containing only a moderate share of round, and yielding a good deal of ashes. In all these properties, nevertheless, it varies much with the locality. The coal in the township of Shelf, is perhaps

superior to that in other parts of the parish. It is divided into hard and soft bed, the first being known by the duller appearance of its texture, and by its being from 25 to 30 yards nearer the surface than the second, which has a brighter lustre. Some of the shafts yield coal of a very inferior kind, which is used only for engines. The greater portion however answers well for kitchen fires, and is much improved by mixing it with the coal of some neighbouring districts, as that from Wyke, Wakefield, Dewsbury, &c., or with that from the north of England. It is customary for those who can afford it, to adopt this practice, but the great bulk of the population, no one will deny, burn the coal of the parish alone.

The coal, as might be expected by those versed in the geology of the district in which it abounds, is at a considerable distance from the surface, and is reached by boring or sinking, or by running galleries under the hill, commencing at its base. When obtained by sinking, the shafts are deeper or not, according to the situation of the coal as regards falls, faults, &c., and in proportion to the difference in elevation along the hills at which these are opened. The nearer they are to the summit of any hill, of course the deeper must the shaft be carried, before we can arrive at the coal. Most of the collieries in North Owram, Shelf, and Elland, have shafts. In many of these places, it lies at a distance of 120 yards from the surface, and is drawn up in corves or scoops by the aid of steam. In others, the soft bed is not more than 20 yards below the ground, and so many forces are brought into play to explain phenomena of this kind, that what is advanced to exemplify one, will never perhaps apply to another. When the soft bed is so near the surface, the hard bed may either be wanting, or by some extraordinary faults may have been brought, with one of its edges, into juxta-position with the soft, thus showing that the space between them was not originally deficient, but that the convulsive movements to which all the strata here have been subjected, have altered the relations of two distinct fields.

Again, although one portion of hard bed may descend almost to perfect contact with the soft, or within any number of yards of it, from one to thirty, yet the soft bed, contained in the strata set in motion, is as far from its accompanying hard bed as before; and this is explained by the fact, that in its descent a large field of soft bed was broken asunder from an adjoining one, and thus the hard bed fell down to its place, or to a point at any distance from its own former situation. In these motions, the strata may assume any direction of level, slope, or perpendicular, so that the two beds are together, or nearly so. In some instances, throws of this nature are so singular, that the coal cannot be excavated at all. The reader will now understand why, by the descent of one coal field, its hard bed will be brought in contact, or nearly so, with the soft bed of a neighbouring field, which may or may not have changed its position, and he will be enabled to explain why there are several collieries in this parish, two or three of which are in the township of Elland, where the strata are placed in this predicament. Added to this, both an upward and a downward motion may be communicated to a stratified series of any extent.

From the bottom of the shaft, which is termed the pit's eye, numerous galleries radiate in the direction of the coal. In other parts of the parish, the coal is obtained by running galleries under the hill. This is particularly the case as regards that line of elevations which unite the townships of Elland and South Owram. The entrances to these collieries are in Elland Park, i. e. on the side of the hill looking towards Elland, and are somewhat more exalted than the bed of the river Calder, which flows down the valley here, and along the northern embankment of which, the hills in question arise. Similar kinds of collieries are in the vicinity of Halifax, Shelf, &c.

The galleries of these pits are continually increasing in length in consequence of the quantity of coal which is, and has been excavated. From the grand gallery, a number of others branch off along the coal field. The coal when picked is conveyed away in corves or scoops, which are urged by boys and girls on railways constructed for their more easy progress either to the pit's eye, whence it is raised to the top of the shaft, should it have one, or should it be a gallery mine, it is drawn along the grand gallery into the open day, by a horse or pony kept for the purpose. In the older and poorer mines, instead of steam engines for drawing up the corves, there are either windlasses worked by the hand, or gins turned by horses. The quantity of coal, which has from time to time been excavated, is truly astonishing; but, as might be expected from the necessary increasing length of the galleries, the expense of mining it is annually augmenting, for the owner must either continue to extend his galleries farther from the pit's eye, or he must sink fresh shafts, both of which circumstances are attended with additional loss of time and money. In many parts of the parish, large fields of coal have already been consumed, and several pits are now closed in consequence of an inability to work them: this impracticability, arising from large collections of water filling the mines, and gathering even more rapidly than can be drawn off by engine pumps. In addition to this, the water cannot in many cases be drained away, either by allowing it to flow into the old works which are near, or by running what is termed a level, because it already

occupies a lower surface than the beds of the Calder and Hebble, these, for the most part, being considered the lowest channels by which all superabundant water escapes. This holds good only as regards the soft bed, for the hard is seldom, if ever, water bound, in consequence of its more elevated position.

From some shafts both hard and soft bed are obtained at the same time, while in others, but a single bed is mined, which may be either the first or second. When both are excavated, the task is effected by sinking down to the soft bed, from which point, galleries are not only bored in the line of this field, but if requisite, a long one is run up to the hard bed, ascending gradually like an inclined plane. This, however, can only well happen, where there are faults, which have brought the two beds nearer to each other. When the coal is reached, numerous galleries are commenced in the direction of this important measure, and any water which may rise easily glides to the lower field, from whence it is withdrawn in one or other of the ways before mentioned.

When but one bed is worked, this may arise from the other being so thin as not to be worth getting, or from the strata being in their natural position, or from the soft bed being unattainable in consequence of a great quantity of water overflowing the mine. Provided that we consider that the soft bed usually lies from 25 to 30 yards below the hard, we are not surprised at the difficulties encountered in the course of sinking for it. Owing to the iron ore which is found above it, the waters here have a cankered, ochreous character, and as such, deposit a good deal of peroxide of iron.

When the strata are regular, the soft bed is seldom touched, until the hard has been extracted.

Much of the coal yielded by several of the collieries, is, as I before stated, very indifferent, and as such only suited for engine fires. When, however, the demand is not sufficient for its exhaustion in this and other ways, it is made into cinders. In this case brick ovens are constructed for the purpose in the immediate neighbourhood of the pits. The coal, being nearly covered in, and the supply of air diminished, burns with a smothered flame, and thus yields up all its volatile ingredients, retaining however the fixed and carbonaceous. The ruddy flames of these ovens, like those from earthenware manufactures, form a remarkable feature in the landscape.

It will be perceived, that all the volatile products, including ammonia, tar, and sulphur, are allowed to escape, thus fairly depriving the manufacturer of the benefit which might, and would arise from preserving them. In this parish, however, I am not aware that they have ever been collected or applied to any useful purpose, as is the case in other parts of the country, where the smoke is conducted through proper horizontal tunnels to a capacious close tunnel, 100 yards in length, built of brick, supported on brick arches, and covered on the top by a shallow pond of water. In this way the bitumen is condensed. If, however, the coke maker is not profited, the land in the vicinity is materially improved by the condensation of the ammonia, &c. It must be remembered, that, in the manufacture of gas and coke at gas establishments, scarcely any of the volatile principles are allowed to fly off, and accordingly they are afterwards employed in several arts. The formation of coke from coal is analogous to that of charcoal from wood, the only difference consisting in the more complex nature of the compounds evolved during the latter process.

There is not, however, nearly the quantity of cinders made here as in the adjoining parishes, because much of this article is procured from the numerous gas establishments, with which Halifax and some of the adjacent villages are largely supplied. The cinders made at these gas works, and at the collieries, are sold to maltsters for their kilns, and to the railway company as fuel for the engines.

The thickness of the coal strata in the parish of Halifax varies from one foot to thirty inches, and cannot of course be excavated without taking away a certain portion of the useless material above it. In accomplishing this, the miner has to work in a recumbent or semi-erect position, and he is aided in his task by the light of a candle, or that of the safety-lamp when the air is foul. When disposed to be industrious, he can extract 18 corves, or 108 strikes, of coal a day, which, as he mines it, is conveyed away in one of these carts by a girl or boy, who is termed his hurrier. Girls continue at this work until they reach their 16th or 17th year, at which time they are taken to some other occupation.

The average price of coal is 7s. 6d. the dozen, a dozen containing 12 corves, and a corve being equal to 6 strikes. At some collieries, scoops are used in place of corves. The former contain only four strikes. For all household purposes, though both hard and soft bed are employed, the former is preferred, since it yields fewer ashes, a hotter fire, and does not consume so rapidly. It emits, however, much sulphureous vapour, and other noxious gases.

The hours of labour amongst colliers are from seven in the morning to four or five o'clock in the afternoon during the winter season, at wages of from 3s. 6d. to 4s. 6d. a day. In summer, however, the period is much shorter, and on an average, they do not work more than three days a-week throughout the year. In this parish there are, as I before stated, upwards of 800 hands employed in this mine, including men, women, and children. In point of morals, they are generally considered somewhat inferior to the other

classes of society. They are apt to indulge in habits of intoxication. After the labour of the day is over, they throng in great numbers to the nearest ale-house, where they continue revelling to a late hour. Leaving this, however, out of consideration, they are a very laborious and intelligent class of society. Many of them, who have been provident and economical during the early part of their career, are in comfortable circumstances during their old age; but it cannot be denied that the majority are very indifferently situated. If they happen to have large families, and these be steady and industrious, they are enabled to maintain a respectable appearance. Of course, the winter season is to them a period of great fatigue. During the hours of labour, and whilst in the mine, they are exposed to much hardship. In consequence of its temperature, they work in a state bordering on nudity, probably up to the ankles in water, and because of the thinness of the coal strata, in an almost recumbent posture. Their only light is a candle, or the safety-lamp of Sir H. Davy. Notwithstanding their arduous exertions, they seem to enjoy this mode of life; and when the hours of labour are passed, they will sit in companies on the pit-hill, or in the adjoining public-house, talking over the arts and the dangers of their occupation.

Children are taken at the early age of seven, eight, and nine years, to aid their parents, and as such their education, whether in an intellectual or moral point of view, is much neglected. For this reason, the same rules which regulate factory labour, ought by all means to be introduced here. The confinement and close air of the pit would seem to impede their growth; in proof of which it may be observed, that the miners of this parish, with very few exceptions, are scarcely of the average bulk and height which is common to manhood. Neither are they blessed with health or length of days. Owing to their position in the mine, to the inhalation of impure air, to the confinement, to the dirty, ochreous water which is often about their feet and ankles, and to their culpable method of living, they soon become afflicted with one or more of those affections to which the thoracic viscera are liable. Amongst these, asthma holds a prominent place, bringing in its train diseases of the heart, phthisis, and hydrothorax, by one or other of which, the poor collier is usually conveyed "to that bourne from which no traveller returns" prior to his attaining his fiftieth year. Constituting, as they do, so important a part of the community, and dying so young, the funeral of a collier has always appeared to me a very melancholy spectacle.

In addition to the above maladies, they are also liable to epilepsy, dyspepsia, sore eyes, and eruptions of the skin. The water of the mine, which generally contains metallic salts, &c. in solution, together with the dirt and mud which may close the pores of the skin, would seem to occasion the eruptions, as well as the soreness of the eyes. The sudden passage from dark to light, and *vice versâ*, may also have a tendency to produce this disorder, whilst their dyspepsia is the consequence of confinement and irregular living.

The chemistry of collieries is fraught with considerable interest; and in remarking on this subject, I will first make a few observations on the properties and qualities of the coal. Much has already been said on this head.

The hard bed has a duller and more resinous aspect than the soft. It contains pyrites. While burning, it often crepitates much, in consequence of the gaseous matter contained within its substance, which is incapable of escaping, but by bursting asunder the layers of coal. It burns with a reddish flame, and yields a few ashes which are red, but of little or no value as manure. It is somewhat brittle and lamellated, and may be broken easily in the direction of its plates. Its specific gravity varies from 1·33 to 1·48. Its constituents are carbon, bitumen, sulphur, and ashes, which last contain principally iron, with a slight proportion of potash and lime. When fresh mined, it is covered with a black carbonaceous powder, which causes it to soil strongly, and it now appears moist.

The soft bed invariably assumes a brighter lustre, and is not overspread with that black powder, which adheres to the hard bed coal. It burns with a large bright yellow flame, and, in consequence of the quantity of combustible gaseous matter which is then evolved, is employed at some of the gas works in this part of the country. It contains no pyrites, has a propensity to cake, and hence is often used for making coke. It is very brittle, breaking readily between the fingers, and is as distinctly lamellated as the hard bed. The distinction between hard and soft bed is not however so perceptible, when one piece is compared with another, as when a heap of the hard bed is compared with a similar quantity of the soft. Its sp. gr. varies, like the hard bed below which it lies, from 1·23 to 1·38. It yields white ashes, and occasions a good deal of dust during its combustion. Its constituents are carbon, bitumen, and ashes, which last, by the way, contain little or no iron, but potash and lime alone, and hence their utility as manure.

Having made these few remarks on the character of the coal, I must now direct my attention to the deleterious gases which are so often evolved in the course of mining. In the pits of this parish, both choke-damp and fire-damp occasionally betray themselves. Their presence is readily explained, when we take into consideration the power which carbon exerts in decomposing water when heated in close retorts along with the latter. Some such decomposition, is effected in the bowels of the

earth, where the action of water on decayed vegetable or carbonaceous matters in the coal, causes the formation of both the gases in question. Thus in the case of choke-damp, one portion of the carbon of the vegetable matter in a state of decomposition, unites with the oxygen of the water, thus forming carbonic acid or choke-damp, whilst in the instance of fire-damp, another portion of the same carbon combines with the hydrogen, and thus gives rise to carburetted hydrogen or fire-damp. I have known repeated instances of great loss of life from both these agents, but inasmuch as the mines are neither so extensive, nor the workmen so numerous as those in the north of England, accidents of this sort, when they do occur, fall on only a few. Choke-damp, or carbonic acid, and other noxious gases are often present, especially in newly opened shafts, or in those which have been unworked for some time. When such is the case, the workmen are in the habit of creating a draught of air, since every pit has what is termed its ventilator, viz. a second shaft, connected by means of a gallery with the principal one, through which the coals are drawn. This current is produced by letting down a kind of iron wicker basket, full of burning coals or cinders suspended at the extremity of a long chain into the primary shaft. This causes a current of air to rush down the ventilator, along the galleries, &c. thus in some measure displacing the foul air in the neighbourhood. Carbonic acid, when partially present, is sometimes displaced by water. When this gas makes its appearance unexpectedly, the collier often escapes the poisonous blast by lying with his face buried in the ground until assistance is rendered him. In this way he inhales fresh air from the earth. This sort of damp is much dreaded by miners. Feared, however, as it may be, the consequences accruing from its presence have never been so disastrous as those arising from fire-damp. In the north of England, instances have recently been put on record, where explosions from the carburetted hydrogen of mines, have in every respect simulated earthquakes. In this part of the country nothing to this extent can occur, though at the same time the few accidents which have occasionally happened, have been severe enough to impress a dread of fire-damp upon the minds of the oldest as well as stoutest miners of the parish.

Of late years, carburetted hydrogen has been evolved in greater abundance than customary, and this condition has brought about the introduction of the safety lamp, though still, owing to the carelessness of most workmen, explosions now and then happen from the use of naked lights. Experience, too, has shown that the Davy, though it may guard, does not completely secure one from danger. The apparatus made by Messrs. Upton and Roberts, of London, answers much better, and probably the improved lamp, more recently put together, and introduced to the notice of the world, by a French gentleman, would, if employed, exempt the collier from all hazard. The disastrous accounts which have lately arrived from the north, coupled with those of other coal districts throughout England, would imply the necessity of insisting especially on the employment of this provision, and it would probably be worth the while of Government to look to this, and to subject all to a penalty, or otherwise render them amenable to the laws, who attempted to work by the aid of any other light than that derived from the safety lamp. I am persuaded, that such a step is particularly requisite, for scarcely three months pass away, that are not rendered terrible in the annals of the collier by accidents from fire-damp. In some cases, it is so abundant as to be evolved from the surface. At the present time, in a field near Tyersall Dane, in the adjoining Parish of Bradford, a fissure having been made in connection with a coal-pit below, the damp escaped, and having by some means become ignited, it has burned for some time, and has attracted a considerable number of persons to the spot. A similar phenomenon occurred some years since on the Byerly estate in the same parish, and like instances have occasionally happened here. I have also collected this gas from stagnant pools.

Several other examples might be adduced, of the escape of carburetted hydrogen from the surface of the earth, and from the beds of rivers, in Great Britain, on the Continent, and in America, but space will not permit me to extend my inquiries into this interesting field. Both the hard and soft bed collieries are subject to be visited by fire-damp. Carbonic acid or choke-damp, though not wanting in the latter, is invariably most abundant in the former. The temperature of many mines differs considerably from the external air. When however there is a current in the galleries, the variation is very trifling, but if such is not the case, then the interior of the pit may exceed in temperature the top of the shaft by several degrees of Fahrenheit.

So much for the chemistry of coal and of the collieries. My next business is to inquire into their geological relations. A very few remarks must suffice, as my paper has already passed the bounds which I had prescribed to myself. What I have to advance may not so much prove true of any individual colliery as it is characteristic of most in the parish. The different strata which are dug through before reaching the coal, are pretty nearly as follows: 1. The superficial soil. 2. A stratum of clay. 3. A thin band of carbonaceous matter, probably the result of the decomposition of trees and vegetables, which may have flourished here formerly. 4. A layer of loose shale. 5. A stratum of argillaceous slaty rock. 6. Loose shale mixed with coaly matter. 7. Flag stone.

8. Shale and blue clay again. 9. Argillaceous rock, easily mined in large blocks, so as to suit the heavier and more important purposes of masonry. 10. Below the last bed, which is usually of great, but variable thickness, we reach another measure of blue clay and shale, intermingled with marl, lime, magnesia, and iron-stone. 11. Now we arrive at the carboniferous system, properly speaking, in the shape of the upper or hard-bed coal, which, in this parish, varies in thickness from 20 to 30 inches. The iron ore which rests upon it, occurs in rounded nodules, superior in size to the largest bombs. They are not applied to any use in this part of the country. 12. Below the hard-bed we have an alternation of clay or seat earth five yards thick—shale, ten yards—soft-bed band, nine inches—hard stone, or callion stone, as miners term it, four feet—shale, thirteen yards and a half—and clay iron ore, one foot, when we arrive at the soft bed, immediately above which the last mentioned mineral rests. It occurs in large flat pieces, with somewhat rounded edges. These are particularly plentiful in the collieries at Shelf, &c. from whence they are sold to one or other of the neighbouring foundries. The metal is principally in the state of a carbonate, but both the oxide and sulphuret are found, all three of which are well worth the trouble and expense of reduction. 13. The soft-bed which is here, varies in thickness like the hard-bed, but reaches only from twelve to twenty-five inches. 14. Beneath this measure we have shale, grit, and sometimes lime-stone; and lower still, the old red sand-stone makes its appearance.

When, however, pits are shallow, some one or more of the strata thus mentioned, which are encountered in sinking the deeper shafts, are entirely wanting. In place of much rock the series then consists of clay and shale, neither of which oppose any great obstacle to the attempt of the miner. The soft-bed band of from about nine to twelve inches thick, and alluded to under number 12, is generally extracted along with the soft bed, providing such can be effected. The collier, however, can never mine it in large pieces. It always crumbles under the pickaxe. It will not form cinders, like the soft bed, but answers well for engine fires. Seams of galena often lie in contact with the coal, and though not very abundant, yet several remarkable instances of its presence have of late years come under my inspection. In many cases, it is very pure, its sp. gr. being about 7·5. Pure carbonate of lime sometimes adheres to the galena. That, likewise, much iron abounds in the strata may be inferred from the circumstance of its having imparted a character to many of the springs and streams, and that sulphur also prevails, and that vegetable decomposition is going forward in the bowels of the earth is fully proved by the fact that one or two sulphuretted waters arise here.

The faults which occur in several of the strata, I may repeat, are well worthy the attention of the geologist. To one I have already alluded. They are often met with in mining the coal, particularly in the vicinity of Elland, &c. when in some instances, in consequence of these throws or faults, both the hard and soft beds are brought nearly on the same plain, or so much displaced as to form a variety of angles with each other. They are also rendered extraordinary by the strata of coal having been in many cases broken, and one field separated by several feet from another, which may itself rest either on a higher or lower level. Disruptions of this kind often puzzle the miner. Where they exist, there is usually a greater amount of water in the mine.

Having thus spared no pains to render the above article as correct in all its details as the almost endless variety of coal strata would permit, I trust it will not only meet with the approbation of the editors of *The Chemist*, but also of their numerous readers. In that case, any trouble I may have undergone in collecting and arranging the materials will be more than amply repaid.

I am, Gentlemen,
Very respectfully yours,
JOHN S. HILEY, M. B.

EXPERIMENTS ON CHONDRINE—A MODIFICATION OF ANIMAL GELATINE.*

BY DR. VOGEL, JUN.

CHONDRINE, which is a modification of gelatine, was discovered by HERR J. MÜLLER, Prof. of anatomy and physiology, at the university of Berlin. He first found it in an osseous pathological tumor, known by the name of *achondrome*, and he afterwards extracted it from permanent cartilages. This substance attracted the attention of several chemists, and especially that of HERR MÜLLER, of Rotterdam. HERR M. had already shewn that there existed a difference between chondrine and the ordinary size of commerce as well as that of fish, &c. By repeating his experiments, I was enabled, however, to find in chondrine some new properties which, with those already known, may contribute to a more intimate knowledge of this substance, and more positively demonstrate the difference between it and common size.

The chondrine which I used in my experiments was extracted from the cartilages of human bones, cut in small pieces, which I boiled in water for forty-eight hours. The

* *Journal de Pharmacie*, August 1841.

filtered liquor was evaporated to a gelatinous consistence and the residue treated with boiling ether, in order to remove the last traces of grease. I made comparative experiments with an aqueous solution of fish size.

Besides the re-agents pointed out by Herr Müller, for detecting chondrine, namely, alum, sulphate of alumina, per-sulphate of iron and acetate of lead, we know of only hydrochloric and acetic acids, which precipitate chondrine from its solution. I found that not only these two acids already observed by Herr Müller, but almost all the mineral, and many organic acids, have the property of precipitating chondrine from its solution.

As the precipitates occasioned by the acids are soluble in the slightest excess of acid, it is not easy to obtain them, for too large a quantity of acid prevents the formation of the precipitate.

In order to form the precipitate by means of sulphuric acid, only a very small quantity of that acid must be employed. In half an ounce of the aqueous solution of chondrine, the precipitate was formed, when a glass tube, previously dipped in sulphuric acid diluted with six parts of water was immersed in it. If one more drop of this acid be added, the precipitate instantly disappears. By adding a greater quantity of a solution of chondrine, the precipitate may be made to re-appear. The same thing occurs with the precipitates occasioned by the other acids, when those precipitates are soluble in an excess of acid.

Sulphurous acid forms in the solution of chondrine, a very abundant precipitate, which is not, however, soluble in an excess of that acid.

Nitric acid forms a very bulky precipitate, but it readily redissolves in an excess of acid.

Phosphoric acid precipitates chondrine from its solution and easily redissolves it; but the precipitate formed by pyrophosphoric acid is, on the contrary, insoluble in a great excess of the same acid. The action of chondrine on pyrophosphoric acid, may therefore serve as a characteristic to distinguish it from uncalcined phosphoric acid.

Phosphorous acid forms, like phosphoric, a precipitate soluble in an excess of acid.

Fluoric acid at first renders the solution cloudy; but by a larger addition, a precipitate is formed which is insoluble in an excess of that acid.

When a current of carbonic acid gas is passed into a solution, flocks are formed, which at first disappear; by continuing the current of carbonic acid gas, the fluid assumes a milky aspect, and, finally, the flocks unite, forming a white and very finely divided deposit. When the current is continued, all the chondrine is completely precipitated from its solution, and the fluid is not altered. The precipitate is not at all changed by the current of carbonic acid gas, and, consequently, it must be regarded as insoluble in a great excess of carbonic acid. On heating the precipitate, it becomes liquid, which also happens after some time, when it is spread on blotting paper to dry. This viscous fluid, which is formed by exposing the precipitate to the air, acts in exactly the same manner as chondrine, and is again precipitated by carbonic acid gas. When we add to the precipitate formed by carbonic acid a small quantity of any dilute acid, a thick scum, arising from the disengagement of carbonic acid gas, is produced, and the residue is chondrine combined with the acid employed. Hence the precipitate must be regarded as a combination of chondrine with carbonic acid. This combination does not appear to be very stable, because it cannot be preserved; for carbonic acid is spontaneously disengaged at the end of a certain time, as I have already said, and leaves for a residue, chondrine in a state of purity.

Chloric and hydriodic acids form in the solution of chondrine precipitates which are soluble in an excess of those acids. The precipitate formed by arsenic acid is soluble in a greater quantity of that acid.

A small quantity of tartaric acid is sufficient for precipitating chondrine from its solution. The precipitate is not soluble in an excess of tartaric acid. The precipitates obtained from chondrine by means of oxalic, citric acids, &c., act in the same manner.

None of the above-mentioned substances produce the least change in a solution of fish size. They may therefore be used for distinguishing a solution of chondrine from that of ordinary gelatine.

In its pure state, chondrine also contains 2·609 per cent. of inorganic salts. The elementary analysis of this substance, when purified, gave me in three experiments, as a mean, the following results:—

C	48·97
H	6·53
O	29·63
N	14·55
S	0·32.

This composition gives the formula H^{330}, C^{310}, O^{145}, N^{80}, which differs but little from Herr Müller's result.

As chondrine partakes the property of size, of becoming a jelly, of swelling in cold water, and of readily dissolving in hot, an idea suggested itself as to whether it was not possible to convert chondrine into gelatine, and *vice versâ*.

The observation that caustic potassa precipitates ordinary gelatine from phosphate of lime, gave Herr Müller the idea of endeavouring to change chondrine, by the addition of phosphate of lime, into ordinary gelatine, without any satisfactory result. It seems to me to result from the following experiment, that the difference between chondrine and size does not consist in a small quantity of phos-

phate of lime:—from a concentrated solution of ordinary gelatine, I precipitated the whole of the lime by oxalate of ammonia. The filtered liquid should have acted like chondrine, which was not the case.

The action of hydrochloric acid on the cartilages is very remarkable. I macerated some of the cartilages of the human ribs in water, very slightly acidulated with hydrochloric acid, at the ordinary temperature. After this, the acid water was decanted, and the cartilages washed several times with distilled water, until the last water was not rendered turbid by nitrate of silver.

Cartilages thus treated, gave, by boiling in water twenty-four hours, a gelatine entirely different, not only from chondrine, but also from ordinary gelatine. The filtered liquor, which was not acid, was evaporated to the consistence of honey, and did not set in a jelly. The evaporated residue, of a deep yellow, was neither viscous nor gelatinous, but, by slow boiling, it detached itself in fine layers, Dissolved in boiling water, none of the acids which precipitate chondrine produced the least change in this solution.

From the above experiments it results:—

1st. That the solution of chondrine is precipitated, besides hydrochloric and acetic acids already indicated, by many other acids, when they are added in very small quantity.

2d. That the precipitates formed by sulphuric, nitric and phosphoric acids are soluble in the same acids.

3d. That, on the contrary, the precipitates which result from the action of sulphurous, pyrophosphoric, carbonic, arsenic, tartaric, oxalic and citric acids on chondrine, are not soluble in the acids employed for precipitation.

4th. That all the acids above-mentioned do not effect any change in the solution of ordinary size.

5th. That the cartilages digested with very dilute hydrochloric acid form, by being boiled with water, a substance which is very different from chondrine, in losing by boiling its viscous and sizing property, and is no longer precipitated by any of the above-named acids, nor by alum and the persulphate of iron.

6th. That the difference between chondrine and ordinary gelatine does not consist in the inorganic salts which it contains, but that chondrine should be looked upon rather as a body differing from ordinary gelatine in its elementary composition,

RESIN OF GUAIACUM.

BY JAMES F. W. JOHNSTON, ESQ., M.A., F.R.S., PROFESSOR OF CHEMISTRY AND MINERALOGY, IN THE UNIVERSITY OF DURHAM.

To the Editors of the Chemist.

GENTLEMEN:—

In the last No. of your useful little journal, you have inserted two short papers regarding guaiacum; as you are probably not aware of my analysis of this resin, I beg to forward you a copy of one of my papers on the resins, where you will find my results.

Believe me your obedient servant,

JAMES F. W. JOHNSTON.

Durham, Sept. 7, 1841.

When the resin of guaiacum of the shops is treated with alcohol in the cold, it is nearly all dissolved, giving a dark brown solution. On evaporating this solution in a flat dish, and heating it for twelve hours at a temperature rising from 180° to about 250° Fahr., a very beautiful transparent ruby-colored resin is obtained, brittle and electric, melting at 212° Fahr., and emitting an agreeable odor.

Of this resin carefully dried,

A 10·647 grs. gave $\dot{C}$=27·167 and $\dot{H}$=6·585.

B 10·995 grs. gave $\dot{C}$=27·975 and $\dot{H}$=6·733.

These results gave per cent.,

	A	B
Carbon	= 70·555	70·35
Hydrogen	= 6·870	6·80
Oxygen	= 22·575	22·85
	100	100

and they correspond more closely with the formula $C_{40}\ H_{23}\ O_{10}$, which gives

46 Carbon	= 305·75	= 70·37
23 Hydrogen	= 28·70	= 6·60
10 Oxygen	= 100·00	= 23·02
	434·45	100

This resin in a natural arrangement, therefore, must stand in the same group as the resins of dragon's blood and of gamboge, which, as we have already seen, may be represented by

Resin of dragon's blood	$C_{40}\ H_{21}\ O_8$
Resin of gamboge	$C_{40}\ H_{23}\ O_8$
Resin of guaiacum	$C_{40}\ H_{23}\ O_{10}$.

Salts of guaiacum resin.—When the solution of this resin in alcohol is added to an alcoholic solution of acetate of lead in excess, a white precipitate falls, which becomes blue on exposure to the sun's rays.* After separating the precipitate, ammonia throws down a further portion from the supernatant liquid. I have analysed three successive portions of the first of these compounds, which contains two equivalents of oxide of lead to forty of carbon; but the results are so little concordant with the results of the uncombined resin, as to render further investigation necessary.

With nitrate of silver this resin gives no precipitate, but on standing exposed to the light, the silver in considerable quantity is

* A delicate photogenic paper may be formed by first washing with an alcoholic solution of guaiacum resin, and afterwards with one of natural acetate of lead.

thrown down in the metallic state. I have not examined what change of composition the resin undergoes during this deoxidation of the metal.

ACTION OF METALLIC POISONS ON VEGETATION.*

BY M. VERVER.

M. VERVER, after having made the qualitative analysis of the soil which was the subject of his experiments, impregnated different parts of it:—

1st. with arsenious acid employed in three different quantities:
2nd. with arsenite of potassa:
3rd. with tartrate of potassa and antimony:
4th. with sulphate of iron:
5th. with sulphate of copper:
6th. with sulphate of zinc:
7th. with protonitrate of mercury:
8th. with bichloride of mercury.

The author sowed in these soils, properly prepared, barley, black wheat, and rye. He observed that, when the quantity of arsenious acid amounted to 1280 grains on a bed of earth of 64 square feet surface, germination was prevented; but that when the quantity of arsenious acid does not exceed 256 grains, the germination, and afterwards even the ripening of the seeds proceeded as usual. Having allowed the stems, leaves and seeds of the cereals thus obtained, to macerate two or three days, at a gentle heat, separately, with a solution of caustic potassa, and having introduced the different solutions, after having concentrated them and neutralized them by sulphuric acid, into Marsh's apparatus; he did not discover any trace of arsenic, which led him to conclude that arsenious acid spread on the earth, does not penetrate in appreciable quantity into the cereals which grow in it. The author took care to examine the earth in which they had been grown, and found that it contained arsenious acid in the soluble state. It would therefore seem that even when they are constantly in a soil containing arsenious acid, the roots of cereals do not take up an appreciable quantity of poisonous matter. It is to be regretted that the author, in seeking for arsenic in these cereals, did not adopt the method of carbonizing the plants by pure nitric acid.

The author has also proved that, in the soil charged with arsenious acid, in which germination had not taken place, the seeds had undergone only the commencement of vegetation. These, submitted to his process of analysis, showed him an appreciable quantity of arsenious acid, which tends to prove that the acid, by penetrating into plants, stops their vegetation; so that it is hardly probable that it should be met with in large quantity in a healthy vegetable, even though grown in a poisoned soil.

The author having impregnated earth with arsenite of potassa, found neither this compound, nor arsenic, in the cereals which he grew in it; but he remarked that the arsenite had become nearly insoluble in the soil, doubtless, on account of having been converted into arsenite of lime by the reaction of the carbonate of lime in the soil on the arsenite of potassa.

The author did not find in the cereals the tartrate of potassa and antimony which had been mixed with the soil in which these vegetables germinated, and where these seeds ripened; but here, also, the antimonial salt had become almost insoluble in the earth.

By adding sulphate of iron to the land, he ascertained that the cereals which grew in it contained in all their parts, and even in their seeds, more iron than those which grew in an ordinary soil; so that it seems that innocuous metallic compounds are more easily absorbed than the others, although sulphate of iron is also decomposed in the earth, and generally becomes insoluble.

By operating in the same manner with sulphate of copper, he also succeeded in demonstrating the presence of this metal in all the parts of the cereals grown on a soil thus prepared. The seeds manifested the presence of this metal, as well as the stems and leaves, although in smaller quantity. The cereals grown on a soil not impregnated with cupreous salt did not present the author any indication of the presence of copper.

The employment of acetate of lead mixed with the soil furnished only negative results; the cereals did not take up an appreciable quantity, probably on account of its speedy decomposition by the soil, which rendered it insoluble. Sulphate of zinc, protonitrate, and bichloride of mercury acted in the same way. These salts, mixed with the soil in small quantity, did not perceptibly influence their germination and vegetation, but on surrounding the plants in a pot with a strong solution of corrosive sublimate, the author found that they perished in a few days, and in this case chemical analysis demonstrated the presence of mercury in several parts.

From these experiments, the author concludes that poisonous metallic substances may, without inconvenience, be mixed with the soil, before the seeds are sown, and without any fear that the cereals which may germinate and vegetate in this soil shall contain them in appreciable quantity.

This memoir, which is the result of a great number of experiments, is deficient with respect to the analytical methods by means of which the author sought to detect the presence of foreign substances in the plants. His investi-

* *L'Institut*, No. 397, August 5, 1841.

gations do not appear to have been always conducted with sufficient care to dispel all doubt as to the value of the negative results obtained.

ACTION OF METALLIC POISONS ON VEGETATION.*

BY M. LOUYET.

M. LOUYET states in his memoir that having divided a garden into several squares or compartments, he mixed the soil in various proportions with arsenious acid, binarseniate of potassa, and sulphate of copper, and that he afterwards sowed in the earth, thus prepared, wheat, barley, corn, garden-cress, and peas. With respect to arsenious acid, he observed, that if the proportion mixed with the soil were too great, germination was prevented; in the contrary case, it took place without interruption, and the different parts (stalks, leaves, and seeds) of the plants which grew in these poisoned soils having been carbonised with nitric acid, did not yield any traces of arsenic in Marsh's apparatus. We may here remark, *en passant*, that the author does not appear to have freed the residue of the carbonisation of these plants from the nitric acid employed, before introducing it into Marsh's apparatus. He should have neutralized this acid with pure potassa, and then have driven off or displaced the nitric acid by pure sulphuric acid; for it is known that the presence of nitric acid in Marsh's apparatus may prevent the disengagement of the arseniuretted hydrogen, which is promptly oxidised or decomposed, under the influence of this acid.

The addition of binarseniate of potassa to the soil is opposed to the germination of plants, and therefore presented nothing remarkable.

Sulphate of copper did not prevent vegetation. The author also ascertained that it became insoluble in the earth with which it was mixed, doubtless by the decomposing influence of the carbonate of lime on this salt. The author could not detect traces of cupreous matter in the vegetables, which grew in the soil with which he had mixed the sulphate of copper; but as the analytical processes to which he had recourse on this occasion do not appear to us to have been executed with all necessary care, we entertain some doubt as to the absolute absence of copper from the vegetables, taking into the account the opposite results of different experiments tried by other men of science. It appears, indeed, from these experiments, that plants which have been raised in a cupreous or ferruginous soil, contain ever so little of these matters, which may penetrate them either in the state of carbonates dissolved in water charged with carbonic acid, or in the state of oxides dissolved by aid of certain principles of the earth.

The author also proved that by introducing into the soil, balls made with a mixture of arsenious acid and farina, as agriculturists often do, neither germination nor vegetation is in any way interrupted, and no arsenic is found in plants grown in this soil, although the poison is found in the earth, in the soluble state several months after its introduction.

The introduction into the soil of either arsenious acid or binarseniate of potassa in powder at the roots of wheat and garden-cress in full vegetation, did not injure those plants, and the poisons were not absorbed. It was not the same when the plants were surrounded with an arsenical solution. A strong plant of *Polygonum Orientale*, in full flower, having been surrounded by a solution of binarseniate of potassa, perished in about twenty-four hours, and the author succeeded in detecting the presence of arsenic, not only in the stalks and leaves, but in the seeds. It therefore appears that metallic poisons may penetrate into the seeds of vegetables, at least under certain circumstances: this was hitherto a matter of doubt.

The author observed, that we cannot by the same means cause solutions of metallic salts, which have the property of being decomposed and rendered insoluble in the earth, such as sulphate of copper, acetate of lead, &c., to penetrate into vegetables.

He afterwards examined the action of dissolved metallic compounds on entire vegetables plunged with their roots into the solutions; and he observed that in this case the metallic compound penetrated into all parts of the vegetable, and even into the seeds of the cereals from which he extracted it, by simply boiling the seeds in water. The author thus proved the penetration into all parts of the plants, of solutions of binarseniate of potassa, arsenious acid, bichloride of mercury, sulphate of copper, persulphate of iron, ferro-cyanuret of potassium, and acetate of lead.

From the results of the author's experiments we are tempted to believe that there is no danger to public health to be apprehended from the practice followed by many agriculturists of spreading arsenious acid in fields for the purpose of destroying animals injurious to the crops; for this poison, even when dissolved by the water of the earth, does not seem to be capable of penetrating, in any sensible quantity, into plants, without stopping the vegetation, and thus preventing the ripening of the seeds. It is to be regretted, however, that the author's experiments do not seem to have been sufficiently numerous, nor made with enough care, and in circumstances calculated to dispel all doubts as to the accuracy of the conclusions at which he has arrived.

* *L'Institut*, No. 397, August 5, 1841.

PROCESS FOR THE PREPARATION OF UREA.*

BY JUSTUS LIEBIG, M.D.

The ordinary process of extracting the urea from urine, consists, as is known, in precipitating by nitric acid, urine evaporated in the sand-bath, to a syrupy consistence, in purifying by repeated crystallisations the nitrate of urea obtained, and in decomposing it by carbonate of baryta or potassa; and finally, by separating, by means of alchol, the urea from the nitrate of baryta or potassa. This is a tedious and expensive process: with 1875 grammes of nitric acid, we rarely obtained more than 64 grammes of pure urea, and in this respect, at the present low price of ferro-cyanuret of potassium, the following process deserves the preference.

Twenty-eight parts of perfectly dried ferro-cyanuret of potassium are mixed with 14 parts of peroxide of manganese, and both are reduced to as fine a powder as possible: the mixture is heated on an iron plate (not in a crucible), over a charcoal fire, to a slight red heat; at this temperature it inflames, and is gradually extinguished; by stirring it several times, it is prevented from agglutinating, and the access of air is facilitated. The extinguished mass, after being cooled, is treated by cold water, and the liquor is mixed with 20½ parts of dry sulphate of ammonia of commerce, or that purposely prepared by saturating sulphuric acid by carbonate of ammonia and evaporating to dryness. It is as well to set aside the first concentrated washing water furnished by the extinguished ferro-cyanuret of potassium, to dissolve, without heat, in the last, the sulphate of ammonia, and to mix the first with that solution. There is generally formed an abundant precipitate of sulphate of potassa; the supernatant liquor is decanted, and evaporated in a sand-bath or warm place, taking care to avoid boiling; there are again deposited crystalline plates of sulphate of potassa, and we must continue to decant the liquor until no farther separation is possible. The last decanted liquid is then evaporated to dryness, and the residue is treated by boiling alcohol of 80—90 per cent.; this dissolves the urea, which crystallizes on the cooling and evaporation of the alcohol, while the sulphates are not dissolved. This process furnishes us with 375 of ferro-cyanuret of potassium, nearly 125 grammes of completely colorless and beautiful crystallized urea.

By the extinction in the air of ferro-cyanuret of potassium mixed with peroxide of manganese, very soluble cyanate of potassa is formed, which dissolves without decomposition in cold water; it must not be heated with water, as it is then decomposed, as is known, into ammonia and bicarbonate of potassa. When the cyanate of potassa is mixed with sulphate of ammonia, there are produced sulphate of potassa and cyanate of ammonia, which is converted into urea, at a gentle heat.

The quantity of oxygen of the peroxide of manganese, is not, as will readily be observed, nearly sufficient for converting all the cyanogen of the ferro-cyanuret into cyanic acid; but an increase in the proportion of this oxide, has the inconvenience of changing a portion of the cyanate formed into carbonate of potassa: it is better, therefore, to obtain from the air the oxygen in which the peroxide of manganese is deficient. Experiments for converting all the cyanogen of the ferro-cyanuret of potassium into cyanic acid by the addition of the calculated quantity of peroxide of manganese and carbonate of potassa, have not given a better result than its extinction in the air with an insufficient quantity of peroxide of manganese.

It sometimes happens that the solution, which contains sulphate of potassa and urea, is colored yellow by the hydro-ferro-cyanuret of ammonia or potassa, which is dissolved in the alcohol and turns the crystals of urea yellow; it is easy to purify it by adding a small quantity of a solution of sulphate of iron. After the separation of the Prussian blue formed, carbonate of ammonia is added, which decomposes the excess of the salt of iron, and decolors the liquor. This is afterwards evaporated and treated in the manner indicated above.

* *Annalen der Chemie und Pharmacie*, Vol. xxxviii, page 108.

ON THE CONVERSION OF URIC INTO HIPPURIC ACID, IN THE URINE OF PERSONS WHO HAVE USED BENZOIC ACID.†

BY M. DE BOUIS.

In the course of a series of investigations undertaken chiefly with the view of arriving at means of dissolving urinary calculi, in the bladder, M. de Bouis proved the fact of the conversion of uric into hippuric acid under the influence of benzoïc acid internally administered.

"Benzoïc acid," says M. de Bouis, "was administered at my request, by Dr. Rayer, to two patients at *La Charité*. The result of this trial, to which I was led by the indications of Dr. Ure, will appear in all its importance, if we call to mind the fact that uric acid and the urates are but very little soluble

† *Comptes Rendus*, No. 7, Aug. 16, 1841.

in water, while hippuric acid and the hippurates are much more so. Indeed, 18 parts of water dissolve 1 part of hippurate of lime: 480 parts are required for dissolving the corresponding urate."

NEW OXIDE OF IRON.*

This combination has been obtained by M. Fremy. It communicates a violet colour to water, and possesses a powerful dyeing principle. It resembles manganese chameleon. It decomposes readily when boiled with an alkali or organic substance having an affinity for oxygen, and is converted into oxygen and sesqui-oxide of iron, of a yellow colour. This combination is a perferrate of potash, which may be procured by calcining peroxide of potassium and peroxide of iron. Fremy has shown that the appearance of a chameleon colour is no proof of the presence of manganese, as it may be confounded with the new oxide of iron. Fremy forms this oxide by igniting a mixture of potash and peroxide of iron; a brown mass is the result, which, by digestion in water, gives a beautiful violet-red solution. This compound is very soluble in water. A large quantity of water decomposes it in the course of time. It becomes insoluble in very alkaline water, forming a brown precipitate, which readily dissolves in pure water, and affords a fine purple solution. It appears much less stable than manganate of potash. A temperature of 212° decomposes it immediately; all organic substances decompose it. It is consequently impossible to filter the solution. It is impossible to isolate this compound, for when the red solution is treated by an acid, when the potash is saturated, oxygen is disengaged, and peroxide of iron precipitated. If the acid is in excess, it dissolves the peroxide, and gives rise to the formation of peroxide salt of iron.

IMPROVED METHOD OF PREPARING PHOSPHORUS.*

By the usual method of preparing this substance, which is of great importance in the manufacture of lucifer matches, so many gases are at once disengaged, that there is much danger from explosions. In order to avoid this inconvenience, the mixtures of phosphate of lime, charcoal, and some parts of sulphuric acid should be well heated in a copper vessel, the bottom of which has been previously heated to redness. This temperature will be sufficient to drive off all the water, which usually amounts to 10—15 per cent. By this means much less phosphuretted hydrogen is evolved. It is best to mix at first only about 1 per cent. of charcoal with the phosphate of lime, and only after having heated the mixture to redness—to add the remainder of the ignited charcoal in order to volatilize the water and the sulphuric acid; because if it is added all at once, the water begins to volatilize at the time when the phosphorus is disengaged. By this plan, very little phosphuretted hydrogen gas is emitted, the phosphorus produced is much more pure than that of commerce; and the second distillation is no longer necessary, since the oxide of phosphorus which remains can be readily decomposed into pure phosphorus and phosphoric acid by treating it with dilute nitric acid at the temperature of 140° to 158°.

CARBONIC ACID OF THE AIR.‡

BY M. BOUSSINGAULT.

M. Boussingault read to the Academy of Sciences, Paris, at its sitting of Aug. 16, 1841, a Memoir, containing the results of investigations which he had made on the quantity of carbonic acid contained in the air of Paris, with the view of determining whether the fact of a greater population is capable of perceptibly augmenting the proportion of carbonic acid which the air contains. The method which he adopted, was based on that proposed by M. Brunner, which consists, as is known, in passing, by means of aspiration produced by the flowing in of a liquid, a determined volume of dry air by a system of absorbing tubes, capable of retaining carbonic acid. The increase of the weight of the tubes gives that of the acid.

Before explaining the results which he obtained by operating in Paris, M. Boussingault sought to estimate the quantity of acid which is daily produced in it. The agents of production which he reckoned in this calculation, are to the number of eight. The following is the enumeration as well as the approximative value fixed according to data, which we will not explain in detail:—

Agents of production.	Carbonic acid produced in twenty-four hours.]
Population	336777 cubic inches.
Horses	132370
Fire wood.....	855385
Wood-charcoal ..	1250700
Pit coal	314215
Wax.....	1071
Tallow	25722
Oil	28401
	2944241

* *Athenæum*, No. 719. † *Athenæum*, No. 720.

‡ *L'Institut*, No. 399, August 19, 1841.

M. Boussingault's experiments were begun in January, 1840, and continued, with some interruptions, until July, 1841: they comprise 142 days. The mean quantity of carbonic acid found in the nine months during which his apparatus was at work, was as follows:—

1840.	January,	3.5 in 10,000 volumes of air.
	August,	3.8
	September,	4.0
	October,	3.8
	November,	3.7
	December,	3.8
1841.	March,	4.2
	May,	4.3
	July,	4.3

The mean deduced from the whole of these observations, is 3.97 in 10,000 vol. of air, taken in Paris. This result was obtained by operating on 7271 litres, at 0° and 0m 76 pressure.

By consulting a table placed at the end of the memoir, it is seen that the maximum quantity of carbonic acid was observed on the 9th of September, 1840: it was 6.7. The minimum proportion was presented on the 10th of December: 10,000 of air gave only 2.2 of carbonic acid.

If these results be compared with those previously obtained by other chemists, we find, for 10,000 volumes of air:—

At Paris, 4.0 according to M. Thenard.

In Switzerland, 4.15 from 104 observations of M. T. de Saussure.

At Groningen, 4.20 from 90 experiments, by M. Verver.

At Paris, 3.97 from 142 experiments, by M. Boussingault.

An experiment made by M. Boussingault, seems to prove that the air respired in Paris does not contain appreciably, more carbonic acid than that of the country. Indeed, on the 21st of May, 1841, a comparative experiment made at Paris and at St. Cloud, gave him:—

At St. Cloud.. 0.000413 carbonic acid in vol.
At Paris 0.000414

And in this experiment the proportioning of the carbonic acid may be relied on to $\frac{1}{20}$.

ON THE INCONVENIENCE ATTENDING FREQUENT ALTERATIONS OF CHEMICAL NOMENCLATURE.

BY MR. W. A. SCOTT.

Much confusion and even danger have arisen from the practice of frequently changing the names of the chemical bodies used in medicine; so great has the inconvenience been felt to be, as to render it a matter of grave consideration with the learned, whether the more ancient names, as calomel, corrosive sublimate, James's powder, &c. are not more serviceable than the more descriptive ones which modern chemistry has substituted. But if the mere changing of a name be felt to be a great evil, it is immensely increased, when the greatest authorities are not agreed upon the propriety of the alteration, each adopting his own system of nomenclature, and thus causing endless confusion, and to the incipient chemist the greatest perplexity.

My attention has been drawn to the subject by observing the discrepancies which exist between the last London Pharmacopœia and Prof. Graham, of University College, and as the subject is not foreign to the design of your periodical, I shall trouble you with a few remarks upon it.

In the last Pharmacopœia, appears for the first time, the equivalent numbers of such bodies as are used in medicine, and upon this, is of course based the nomenclature adopted in the work; on passing your eye up these numbers, and comparing them with those given in Graham's Chemistry, there will appear several grave differences, some of the numbers being doubled or trebled, whilst others are halved; for instance,

Atomic weight of	In Pharm.	In Graham.
Copper	64	31.71
Arsenic	38	75.34
Antimony	44	129.24
Phosphorus	12	31,44 !!!
Mercury	200	101.43

Now, passing over copper, arsenic, antimony and phosphorus, as being of less moment, let us enquire what this change involves in the case of mercury? It is evidently impossible with this alteration to preserve unchanged the names of the several preparations as given in the pharmacopœia, and accordingly we have such changes introduced, as, if not properly looked after by the pharmaceutical chemist, will give rise to innumerable mistakes. e. g.

	According to the Pharm.	According to Graham.
Black oxide	Oxide of merc.	Suboxide merc.
Red ,,	Binoxide ,,	Oxide "
Calomel	Chloride ,,	Subchloride
Corrosive sub.	Bichloride ,,	Chloride ,,
,, ,,	Bycyanide ,,	Cyanide ,,
Yellow iodide	Iodide ,,	Subiodide ,,
Red ,,	Biniodide ,,	Iodide, &c.

Now, let us suppose the juvenile chemist, who, with laudable desire for self improvement has just been studying Graham's Chemistry, (the best work on the subject), is called away to compound a prescription in which hydrarg. chlor. P. L. occurs, would not serious consequences result from the substitution of Graham's chloride of mercury? and if so, ought not the matter to be well attended to by those who have the superintendence of them? But you ask, what remedy do I propose in this land of liberty, where each follows his own sweet will in naming chemical compounds? My plan is as follows:—let the "parliament of science," i. e. the "British Association," be empowered to appoint a committee, the

officers of its own "Section B," if you will, to investigate the claims of any who may propose to re-christen nature's bantlings, and if approved, stand sponsor to, and be responsible for it to the public, until superseded by the fiat of a subsequent committee. This committee may be appointed annually, as the officers of the section are at present, and would at least ensure uniformity for the year, and I think British chemists would bow to the decision.

Another matter there is which ought to be settled by authority, viz., whether oxygen or hydrogen be adopted as unity in the scale of equivalents: on this question great diversity exists; Graham and Liebig preferring oxygen (= 100). whilst Turner, and the London Pharmacopœia, give hydrogen (= 1). For my own part, the hydrogen series seems most convenient; the numbers being smaller are more easily retained in the memory, and if, as Dalton, Thomson, and others have asserted, all bodies are multiples of hydrogen, there seems no objection to its general adoption.

LONDON ELECTRICAL SOCIETY.

IMPROVMENTS IN ELECTRO-GILDING AND ELECTRO-PLATING.

Tuesday, Sept. 21st.—Of the papers read this evening, one is of peculiar interest: *An account of a method of Electro-gilding and Electro-plating, at the expence of the Anode*, by Chas. V. Walker, Esq. Hon. Sec.

The author states that these objects have been accomplished hitherto by the use of a single cell, and, therefore, at the expense of a salt of gold or silver. These salts are troublesome to prepare, and are expensive; but as this plan has been so generally adopted, he conceived that there might be some fundamental difficulty connected with the other mode. As, however, no one had written on the subject, he was induced to go through a series of experiments with a decomposition cell, in order to determine whether the anions would combine with gold and silver anodes; for if so, the operations of plating and gilding might be rendered more *simple*, more *sure*, and more *economical*. He selected that salt, which, from its having been patented, may be assumed to rank first in the list, preparing solutions by dissolving the oxides of silver and of gold, each in a solution of cyanide of potassium. He experimented upon electrotype medals, &c., electrotyping the solutions respectively with a silver and a gold anode. After a few seconds of action, deposites are obtained; the medals are removed and polished, and re-immersed, according to the thickness required. The author describes the mode of preparing the surfaces for gilding and silvering, and the management of the anode. He also describes the arrangement for obtaining *thick* deposites. All this however he conceives to be of minor importance, compared with the fact, that the cyanogen, released at the anode, combines with it, whether it be *silver* or *gold*, and destroys a portion, equivalent to that deposited on the surface of the medals; and thus the strength of the solution is maintained, and *the expense of the operation is reduced to a minimum*. The deposition is effected in glass cells, and thus the eye can detect the regularity of the process. The anodes were gold silver wire, and silver plate. They were considerably consumed. In illustration of this communication, Mr. Walker submitted to the society a series of medals, silvered and gilded in this manner.——Several other papers were read. In one was a test by Dr. Leeson, recommended to be applied to the sulphuric acid employed in electro-chemical purposes, viz. a solution of sulphate of indigo. If, after mixing this with the acid and applying heat, the blue colour disappears, it indicates the presence of nitric acid; an impurity far more detrimental to the zinc plate than is imagined: for it attacks the mercury and exposes portions of the zinc so as to form elementary pairs and to produce a great amount of local action. Mr. Grove recommends platinized silver gauze for Mr. Smee's battery, he has prepared one with copper gauze, and gains considerably; he had been unable to procure silver gauze. The secretary who made the communication, recommended the deposition of copper on copper gauze; then the deposition of silver, and lastly, platinization.

REVIEW.

ELECTROTYPE MANIPULATION: *being the Theory, and plain Instructions in the Art of Working in Metals, by precipitating them from their Solutions, through the Agency of Galvanic or Voltaic Electricity.* By Charles V. Walker, Hon. Sec. Lond. Elect. Soc. Illustrated by Wood Cuts. Fifth Edition, with Additions. London: George Knight and Sons, Foster Lane, Cheapside.

Of a work which has gone through five editions, little need be said in the way of praise. This little treatise is already well known to the public, by whom its merits have been duly appreciated. Its most distinguishing characteristics are, besides its cheapness, its adaptation to every capacity, its explicitness, and the vast quantity of information condensed in so small a space. To those who cannot afford to purchase Smee's more expensive work, this will be invaluable: they may obtain all the information required for electrotyp[e]

experiments, at the trifling cost of one shilling.

The London Electrical Society, to which Mr. Walker is honorary secretary, has done much towards propagating a knowledge of electrical science, and we hope that the sphere of its action will become daily more and more extended.

Our readers will find some valuable new matter in the present edition; amongst which, we may mention the description of a battery requiring neither acid nor mercury, some new bronzes, observations on mould-making, &c.

We are glad to see that Mr. Walker announces a second part of "Electrotype Manipulation," which will exclusively treat of that attractive branch of the science—the deposition of gold and silver; and containing an account of the several applications of the art.

II. CHEMICAL MANUFACTURES.

REPORT CONCERNING THE FURNACES AND STOVES OF THE MANUFACTORY OF WASSERALFINGEN, WORKED BY GAS.*

BY R. H. SCHOENBERG.

When we endeavour to include in one *coup-d'œil* the progress that has hitherto been made in the manufacture of iron, we feel great satisfaction in reflecting on the success which this important branch of industry has attained, and the wonderful effects which have resulted from the aid it has received from science since the commencement of the present century. The numerous efforts that have been made by the iron-masters and the proprietors of iron-foundries to diminish the expenses of manufacture, by economy in the materials, are remarkable; and most particularly the attempts of every description that have been made to economize fuel.

It is with reference to this object that in blast furnaces and in refinery stoves successive trials have been made of charcoal, coke, of charred wood, coal, and even of anthracite and turf; and that a new mode has thus been introduced of removing the difficulties consequent to the manufacture, and of diminishing the expenses which attend its production. Subsequently were introduced, the application of heated air, the application of the flame from the mouth of the chimney of blast furnaces to various purposes, and an infinity of other valuable inventions.

The most important of all these improvements is, perhaps, the one for which we are indebted to M. de Faber, director of the iron manufactories of Wasseralfingen, in Wurtemberg, who has been successful in his attempts to collect before it issues from the mouth of the chimney, the gas which is generated in blast furnaces, and which forms the flame that thus escapes, and of applying it as a combustible in refinery stoves, and in puddling and reverberatory furnaces.

* *Inventors' Advocate*, No. 110.

The application of the flame issuing from the mouth of the chimney to different purposes, such as heating the air to be forced into the blast furnaces, burning lime, roasting the ore, making coke, heating steam boilers, &c., has been known for seven or eight years; yet in all these cases it has been found impossible to produce with this flame a temperature exceeding red heat, which has imposed limits to this method of application, whilst the method of M. de Faber is calculated to produce the highest temperature that can be required in making iron.

The principal method by which this process is characterized, is the following manner of burning the gas, with the introduction of atmospheric air forced through bellows, and in the ingenious construction of the stoves and furnaces.

The conclusions which have been arrived at after many years' experience may, without exaggeration, be considered wonderful, and the discovery to which we allude has introduced a new era in the manufacture of iron quite as remarkable as that for which practical mechanics is indebted to the steam-engine. At Wasseralfingen there are at the present time three furnaces or stoves, worked only by escaped gas, in active operation. It is to the blast furnace from the south, introduced into this establishment, that the requisite quantity of gas is extracted for heating a refining furnace. The application of this method is very simple, and is effected by introducing a tube to a certain depth into the chimney of the blast furnace. It seems that by this means there is obtained at most one-sixth or a fifth of the total quantity of gas produced, and which escapes from this furnace, and it is certain that, notwithstanding this subtraction, there is scarcely any perceptible diminution in the flame which issues from the mouth of the chimney.

The refining furnace produces about 175 metrical quintals of fine metal weekly, which is always of a beautifully white color, like silver. The method of refining in this gas

furnace is brought to such a high degree of perfection, that the iron always runs from it, in a great degree, decarburetted, and it is freed from all impurities, and, among others, from phosphorus and sulphur. The waste, which in the English refining furnaces worked by coke is never less than from nine to ten per cent.; when the furnace is in good order never exceeds from one to two per cent. Neither must the circumstance be forgotten that the cast-iron passed through the refining furnace usually only consists of fragments from the foundry, which, as is known, contain a considerable quantity of sand adhering to them from the moulds. The whole operation is so well regulated, and all is conducted with so much uniformity, that there is little liability to those miscalculations and losses which are only too common in the refining furnaces generally used. The expences of manual labour are also equally small.

The results of puddling with gas, have not been attended with less satisfactory results. The puddling furnace, which has been constructed at Wasseralfingen, and which is in operation there, uses the same gas as the blast furnaces of the north.

In the chimney of this one, two suction pipes are introduced to a suitable depth; by means of these a sufficient quantity of gas can be collected to keep a puddling furnace and a reverberatory furnace in operation at the same time; but the power of the water-wheel which puts the bellows in action not being sufficiently great, these furnaces can only be kept in operation alternately.

The temperature of the gas puddling stove is, according to the nature of the process, even higher than that of a similar kind of furnace supplied with wood, coal, or turf. The flame is clear and transparent, so that the workman is enabled to command at a single glance all the points in which it is most active. The operation when properly conducted proceeds with perfect regularity and uniformity. In each of these operations from 1·75 to 2 metrical quintals are charged with fine metal previously heated till they are red hot, and in from one hour and three quarters to two hours the bars are ready to be shingled. The waste of fine metal during this process is so trifling, that it has been found on an average not to exceed from 1 to 2 per cent. The quality of the produce is excellent.

One peculiar characteristic of puddling with gas is, that the formation and reduction of the scoriæ goes on at the same time.

The produce of the gas-puddling furnace, amounts weekly to about 125 metrical quintals. The operation in the gas reverberatory furnace, presents also, as in the two preceding cases, very remarkable advantages; yet this operation has not been attended with such important results as those obtained in the refining furnace and puddling stove; for the waste occasioned by the scoriæ in this case is very considerable, since it amounts from 12 to 13 per cent., and sometimes to more. The action of the stove is good, and the temperature sufficiently elevated, so that when no accident occurs, as many as 150 metrical quintals can be submitted to the action of the reverberatory furnace weekly.

After what has been observed, it will be seen that the result of the gas stoves and furnaces of Wasseralfingen, may be considered very satisfactory. According to the preceding data, bar iron of excellent quality can be made with a waste which scarcely exceeds 12 to 15 per cent., and without any expense in the consumption of combustible; or, to speak more correctly by making the application of a combustible, which had hitherto remained useless.

It is difficult at present to estimate the full extent of the important advantages which would result from using the gases which escape from blast furnaces, according to the plan adopted by M. Faber; but it appears certain that this plan unexpectedly opens a vast field of improvement to the iron trade, and that it ought to occupy the serious attention of all who are engaged in this manufacture. Let us hope that, if any prejudices still exist, they will be removed by the great progress that has been made; the numerous and well-authenticated proofs of which do not admit of the least uncertainty with respect to an operation, the advantages of which may have hitherto appeared doubtful, because not sanctioned by experience.

COMPOSITION FOR TAKING IMPRESSIONS OF METALLIC OR PLASTER CASTS TO BE MULTIPLIED BY THE ELECTROTYPE.

To the Editors of the Chemist.

Gentlemen:—

Being one of the many of your readers who have doubtless been engaged in experiments on the new and highly interesting art of electrotype, and having felt greatly mortified at the destruction of very many fine casts in taking wax impressions therefrom, and having arrived at the knowledge of a composition which since its discovery has uniformly proved far superior to anything else recommended for the purpose in works on the subject, I have much pleasure in submitting it to the notice of your readers; it will enable any person to take very perfect impressions from either plaster or metal, however elaborate their workmanship, without in the least injuring the original:—

Mutton suet, previously melted and strained . . .	1½ oz.
White or virgin wax . .	1½ ,,
Spermaceti	½ ,,

Melt together, and use in the same manner as

wax, by first dipping the bottoms only of the casts in boiling water, until the face becomes dull, then quickly tie round the outer edge some stiff cartridge paper or board, and pour in the melted composition. Stir it with a camel's hair brush for a few seconds to disperse any air bubbles that may be formed. Let it stand until it sets, when the paper may be removed, and the impression easily detached.

In using metallic moulds, it is necessary that they should be warmed previous to pouring on the composition.

Trusting this communication will not only give an additional interest to the art, but prove of infinite service to experimentalists,

I am, Gentlemen,
Your's respectfully,
JOHN HORSLEY.

Ryde, I. W.
Sept. 10, 1841.

III. PHARMACY, &c.

ON A NEW SYSTEM OF MEDICAL EDUCATION, GOVERNMENT, AND PRACTICE.

BY CHARLES WATT.

IN conformity with an engagement in the last Number, we proceed to lay before our readers a plan of education, government, and practice, which an experience of more than twenty years, the most extended opportunities of observation of, and reflection on its benefits, and of the sad consequences which arise from that now adopted, have proved is alone calculated to exalt the respectability of the profession, to exterminate ignorance and empyricism from its ranks, and consequently to confer the greatest and most permanent benefits on mankind.

In consequence of this being the period of the meeting of the various medical schools in the kingdom, we have reserved it in order that it might be offered to our subscribers under the most favourable circumstances for circulation.

In teaching the sciences, the following OBJECTS are in the highest degree IMPORTANT —the best method of impressing on the minds of pupils the facts, and the doctrines arising from them, and the employment of a check, by which the professor may be enabled daily to ascertain the attention, conduct, and progress of his pupil; and on the part of the latter, the necessity of constant and progressive study. These important obligations may indeed be said to be equally due from each of these parties to the other, and from both to the public, in relation to whom it is their duty to fulfil them, or to relinquish the engagement.

That these objects however cannot be, and indeed never are, thoroughly accomplished by THE PRACTICE OF LECTURES, has long been my established conviction; and this has been confirmed by the experience of years, during which I have had ample opportunities of witnessing the melancholy effects resulting from adherence to so inefficient and worthless a system.

In these remarks, it is accordingly my duty to point out and to prove that the greatest evils arise from this method of teaching, inasmuch as it gives too wide a scope to the vanity, favoritism, and cupidity of teachers, which, coupled with the distance and reserve between them and the students, is the principal, if not the sole cause, of the ignorance and misconduct of the latter. That these evils abound in our institutions for education is, to their disgrace, admitted on all sides, as well as the urgent necessity for the substitution of some method which may contribute more to the credit of professions, and to the benefit of the public.

Although, in pointing out the errors of the present system, I shall confine my observations to the medical sciences, as being of the most vital and universal importance, they will, nevertheless, apply with equal propriety and force to every branch of knowledge taught by lectures.

Of THE PROFESSORS, I may remark that very few, at the present time, are above a very ordinary and humble rank, as to talent or acquirements. There seems to be in some persons a natural propensity to assume the office of lecturers, preachers, or spouters of science, as affording them the best opportunity for display and notoriety; while, in almost all cases, they present an exhibition only of ignorance, folly, and presumption. Every one, indeed, must have observed the ridiculous

ambition exhibited even by some pupils, after they have attended only one or two courses, and before they have acquired any thing like respectable knowledge, to become lecturers; and this is, in many instances, carried so far as to induce them, in consideration of a small fee for each attendance, to congregate a class, including even women and children, at their mountebank exhibitions; and thus to bring science and its abler professors into ridicule and contempt. I remember one of these assemblies in a place near Shoe Lane, where anatomy and chemistry were the subjects, and the audience (which was far from select) paid some few pence for admission.

Such being the case, it will not be wondered that the ABSENCE OF METHOD in the various departments connected with the study of medicine, should afford sad proof of the defective state of medical education. Can, indeed, anything be better evidence of the worthlessness of such a system, or more plainly demonstrate the necessity of reformation, than the mass of heterogeneous confusion which is delivered to pupils, even by some of those who are accounted the best lecturers, but whose chief object appears to be, to attract attention, by affected oratory, or by the relation of facetious anecdotes? Does not this directly prove, that the teacher feels the facts he delivers to be so destitute of connecting circumstances—so insulated, as to require such aid, in order to give them the remotest chance of impression on the memory? Instead of making their chief object the discovery of a simple, facile, and impressive mode of conveying knowledge, these men, in order to facilitate the remembrance of certain facts, which by their own erroneous system are so placed as to defy recollection, adopt the lazy expedient of introducing stories, cases, and anecdotes, often of the coarsest and most vulgar cast, reflecting only disgrace upon a school of science and the profession with which it is connected. Every one of any standing in the profession, can recollect the anecdotes of the Abernethies, the Coopers, the Blizards, and the Homes "cum multis aliis;" and at the present time some of the servile herd of imitators of their example garnish their harangues with trash too despicable to be worth quotation; forming a ludicrous contrast with the period when the teachers of the art of medicine boasted in their ranks such illustrious men as Monro, Gregory, Black, John and William Hunter, Barclay, and Davy.

This want of method is the cause of much DISTRACTION AND LOSS OF TIME even to such students as are ardently devoted to, and diligently pursuing, their studies. The irregularity and confusion in the lectures, demonstrations, dissections, &c., are so annoying to the pupil, that he is often driven to the point of altogether quitting the study of them, or, as I have often seen, is subjected in a serious degree to mental distress and excitement. What memory, indeed, even of the most attentive student, however powerful by nature or improved by practice, can retain the facts comprised in a demonstrative lecture of an hour's duration, or even any considerable portion of these facts, supposing them to be far better arranged than they usually are? Would not any one be deemed insane who should attempt to teach by lectures the words of a language? Would he succeed in teaching them, if he made the attempt? No. Neither can any one, by such means, teach with accuracy, though he may deliver, and that faithfully, the whole doctrines of the sciences. This he would do with little or no benefit to the pupil; for it is one thing to deliver, and quite another to receive and retain doctrines. Were it not so, why so many auxiliaries to assist the pupil? The reason is plain: the defect is severely felt, though not acknowledged.

Another, and not less serious evil, in this method of teaching by lectures, is its engendering IDLENESS AND INATTENTION, inasmuch as it does not admit of the pupil being, from the time of his entrance on study, made to commence and throughout continue to work for himself; there being no daily method, by which the professor can detect his inattention, or ascertain his progress, except those trifling and flimsy catechetical trials which are sometimes made, and to which few of those who really know the answers will publicly reply.

From devotion to this long established custom, it may be argued, that by the discontinuance of lectures, we should lose the valuable observations, experience and remarks of many able and enlightened men, who are not otherwise in the habit of giving to the world the results of their labors. This, I reply, is the very reverse of an objection to the system proposed—it proves its higher value; for the opinions

and observations of such men will be far more beneficial and instructive to persons who, by a proper system, have acquired a full and accurate knowledge of the subject treated of, than to such as have, under a bad system, acquired imperfect and limited knowledge. That the observations of persons of great experience and extensive knowledge are very valuable, I by no means deny; but I affirm, that they are so, only when delivered to those who are versed in the bases of the subject upon which they treat, and that in exact proportion to the degree of knowledge possessed by the audience.

So forcibly indeed is this defect felt, though never distinctly noticed, and still less attempted to be removed by a more rational course, that, to make up for omissions, and to furnish a better knowledge of the particular science occupying the attention of the pupil, a certain class of persons reside in, or are attached to the different universities and other institutions of learning (especially where medical science is taught), who are employed and recognized as the regular and indispensable helpers of the students doomed to submit to this unsystematic, imperfect and tedious method, in order to obtain even the very limited knowledge which is but too commonly possessed by them.

The consequent IMMORALITY AND DISSIPATION in which many students indulge, are well known. Young men sent up from remote parts of the country to a city like London, are so dazzled by the show and gaiety of the place, and are so often misled by the more unsteady of the medical students, that, if not very firm in principles and conduct, they are soon drawn into folly and vice which often lead to ruin. It must, therefore, be evident to every one, that parents and friends are strikingly deficient in caution when they entrust their sons, under the plan of instruction at present in use, to the dangers of allurement and bad associates. In what, I would here enquire, consist the chief pursuits and occupation of by far the greater number of young men sent to gain a knowledge of their profession at the various schools in this country, especially in London? Are they devoted to the study of its different branches, and excited by an enthusiastic ardour and ambition to excel?—That some undoubtedly are, I will not deny; but by far the greater number are the associates of idlers and drunkards, frequenters of theatres, smoking divans, and even gambling houses and brothels. Such is the opportunity and scope for idleness and dissipation, which the present negligent and inefficient course of education affords.

That the CHIEF OBJECT OF MOST OF THE STUDENTS, is to endeavour to pass through their examinations with the least possible trouble, and to obtain that very scanty amount of scientific knowledge which will enable them just to gain their diplomas, at either of those libels upon scientific boards—Apothecaries' Hall or the College of Surgeons—is but too evident. It is consequently a fact, equally notorious and lamentable, that under the present system, their studies are postponed and neglected until the very last moment; when, the period of examination approaches, they, in a state of most pitiable excitation, of action and fear, seek eagerly for foreign assistance, in order to fit them for the ordeal which they must undergo,—to be, as is often the case, totally rejected, or to go through it with such hair-breadth chance as is not only painful in endurance, but even in contemplation; to which probably, under a proper system, they would have looked forward without pain, and which they would have passed through with honor to themselves and credit to their teachers.

That the method of oral declamation, then, is not only not the best, but the very worst by which a science of facts can be taught, is a truth which no one of the least reflection or experience will deny. For these reasons, it is the duty of all well-wishers of science to use their utmost influence to secure the attainment of that method, by which it may be taught, not preached. To the developement of such a system as will attain this, my effects shall be directed.

Having spoken of the lecturers and lectures, I must now speak of the EXAMINERS. The highly dishonourable and disgraceful system of excluding others from their rank, perpetuated by certain chirurgical aristocrats, makes the whole of their procedure a most contemptible burlesque. This system of electing examiners, the class from which they are chosen, and the situation in which they are placed—being themselves in practice, are highly prejudicial to the independence and honor of the profession and to the interests of society.

From the circumstance of practice being their chief object, their time will not allow them to go into that detail of examination which ought to be instituted; and their having to sit in judgment upon the sons or relatives of their co-practitioners, with whom they are on terms of friendship, gives opportunity for bias and partiality, and places them in a very invidious situation. It is but very lately that some of those who had retired from practice had arrived at a state of incapable senility, and yet retained the office of examiners.

As to THE EXAMINATIONS, the method pursued at the College of Surgeons is even less appropriate than that at Apothecaries' Hall; and most of the members of that board being not only in practice, but teachers, there are by far too many causes of partial, hasty, and inefficient scrutiny into the pupil's acquirements. Of the nature and character of these examinations, it is impossible to speak without the most unqualified disgust, and without feeling it to be a duty to hold up to contempt the whole system, and the illiterate agents who officiate under it as examiners.

It is well known that some examiners have a routine vocabulary of questions which they bring forth on all occasions. Before a pupil goes up for examination, he is often furnished with information of this by fellow students who have preceded him in the same mummery. If it should happen that the examiner has written on any particular subject, that will probably form the topic, as if a childish "*cacoethes scribendi*" on the only subject he is well acquainted with, were still operating in his mind.

By other individuals of this Junto, the questions put are so framed as either actually to tell the pupil the answer, or, on the contrary, to mislead him, at a time when, under a state of high nervous excitement, which always exists on such occasions, he is so confused as to feel uncertain of his knowledge of the question, though, if properly interrogated, he is in fact prepared correctly to reply to it. Thus, if one examiner happen to be present, the interrogation runs thus: "If you open such and such parts, won't you see so and so?" Another may tell him what is partly true, and partly false, in order to elicit his knowledge by a sort of puzzle! If he meet a third party, another train of interrogations may be put, suitable to the fancy of the examiner.

Often the questions to be answered are so totally unconnected with the real objects to which they ought to refer to, that to every reflecting mind, it must be evident, that the teachers want as much, and the system more, reformation than the pupils. When it is stated as a fact that the following question, among numerous others, equally absurd, was very recently put by one of the sages at Apothecaries' Hall, to a young man from the country, no more surely can be wanting to convince the public into what worthless hands are entrusted the guardianship of the education of medical men, and that most important of all charges, the health of the community. The question was, "What are the railings round St. Paul's made of?—"Iron." "What kind of Iron?" "Wrought iron." "What is the difference between that and cast iron?"—"One is iron, the other a carburet of iron." After this specimen of mummery, what is the value to the student of a diploma from such hands? or the degree of protection to society against ignorance on the part of the practitioner?

Though, under such a system, the pupil may congratulate himself upon his escape from rejection and from being made a victim to an erroneous method, he cannot feel any real and permanent satisfaction. That can arise only from a confident knowledge of the subject, and his power to pass through the several examinations—a qualification possessed by few who present themselves at these Boards. There, the "laudari a laudato viro" is indeed little known.

Thus a few desultory and irrelevant questions, put during some twenty minutes or half an hour, to the pupil, entitle him to practise! It may be argued, that if the person examined replies promptly and correctly to any question which *happens* to be put to him, it affords an inference that he is acquainted with the subject generally, and must have applied himself diligently to his profession. That it is *presumptive evidence* of such application and acquirement, must be admitted; but this is not sufficient to entitle him to a licence to practise: it is *proof alone* that can be the foundation of perfect qualification.

Surely, then, such facts (and who dare deny them?) are enough to convince the public of the urgent necessity of reformation in every stage and step of medical education, from the entrance of the pupil on his studies to

his final test of qualification; and this not merely in what relates to the pupil, but to his instructors, and to the whole chain of proceedings, from the idle and noxious method of lectures, to the last farcical climax of examinations. Indeed, no change is worth the slightest trouble, nor will produce the remotest success, except it include a total reformation of the mode of teaching, from the commencement of study to the entrance upon practice.

But the method of determining the knowledge of pupils, is not more disgraceful than the scene which takes place both before the commencement and during the continuance of that farce. With what disgust must every one have witnessed the self-satisfied, easy, careless effrontery, and the cold-blooded, heartless contempt of the feelings of the candidates, displayed by the members of that learned court, styled the "Collegium Regale Chirurgorum," as their elegant Latin title styles their sanctuary; while the feelings of the youthful probationer are either wrought to a state of frenzy, or he is on the point of fainting, as his blanched face and quivering lips too plainly tell—unless indeed he has been dosed with opium or hyoscyamus, as is the common practice. During this agonizing period, the examiners are generally occupied in frivolous conversation with each other and with certain titled members, to whom the lower part of the assembly are very courteous, in order to display the familiar terms existing between them. Viewed indeed, as a body, they are a kind of Star-chamber Inquisition, to attempt to revoke whose decrees would be vain. Their acts admit of no repeal; their decisions admit of no revision; and it is to a change of system, and not of men, that we must apply for the substitution of a better method of education, and for a more rapid advancement of medical science.

(To be continued.)

INUTILITY OF THE PHARMACEUTICAL SOCIETY TO COUNTRY DRUGGISTS.

"That the present state of medical education, government, and practice, can no longer be suffered to disgrace the name of science in this country, and that society cannot longer be left unprotected against ignorance, folly, and imposition, nor the educated and enlightened practitioner be cheated of his just rights, and permitted to remain on the same degraded level with the illiterate pretender and fraudulent empyric, must be evident to all who are conversant with the subject, or possessed of common reflection."

Vide *The Chemist*, No. XXI, p. 280.

"The existence of such a body as the untaught tradesmen who arrogate to themselves the title of Chemists, remains, as one of the most amusing absurdities of the nineteenth century."—Vide *Dr. G. O. Rees on the Analysis of Blood and Urine*, p. 10.

To the Editors of The Chemist.

Gentlemen:—

In the last No. of your Magazine there is a letter from Mr. John Fordred of Ashford, on the subject of Medical Reform, and the Pharmaceutical Society; permit me to offer a few remarks on the same subject.

I have viewed with interest the rise and progress of the society above named; I rejoice in its rise, I lament that its progress is not more marked and distinct, and I doubt not that hundreds of my provincial brethren have experienced the same feelings. In the letter which I have mentioned, there are some very trite observations respecting the rates of subscription payable to this society: can it be expected that the druggist living one or two hundred miles from the metropolis, and who therefore cannot possibly take part in the scientific discussions of this body, attend its meetings, or avail himself of the use of its laboratory, or library, will contribute to its funds in the same proportion as those who can reap the full measure of its benefits? Is it just that he should do so? would it be wise on his part? Ask the London druggist which, as a body, he considers the best chemists, the London or the provincial druggists? and see if he will for a moment hesitate to tell you of the advantages which he possesses over his less fortunate brother. I am not desirous of contesting the point, even if the answer proved, as I have supposed it would; this I know, the metropolitan druggist already possesses many opportunities of gaining a knowledge of chemistry, which do not exist in the country: whether he uses those opportunities to the extent to which he ought to do, and whether we are able to make up for the absence of them by dint of perseverance and close application, I must leave the impartial to judge; but it must not be expected that we shall uphold a Society from which we cannot obtain our fair share of benefit.

The prospectus of the Pharmaceutical Society of Great Britain, (great name this!) sets forth that the Society "is instituted for the purpose of uniting the Chemists and Druggists into one ostensible, recognised, and independent body; for protecting their general interests, and for the advancement of Pharmacy, by furnishing such a uniform system of education as shall secure to the profession, and the public, the safest and most efficient administration of medicine." It may be well to consider how far it is likely to effect these objects. I am at a loss to know how uniting

the members of this trade into one body can make them either independent or recognised.

It is said that union gives strength: true, it does do so; and in this instance the force of union has been successfully employed, in opposing the various bills brought before parliament, which, while their professed object was to reform the higher walk of medicine, sought to inflict disabilities on the druggist, and rob him of a part of his business. Thus, I freely admit that the Pharmaceutical Society of Great Britain has been of great service in concentrating the strength of the trade, for the purpose of "protecting their general interests;" in this the country druggist has an equal stake with his metropolitan fellow-tradesman, and for which he ought and would willingly contribute an equal subscription, but it cannot be requisite that that subscription should be two guineas, or one guinea, or even a moiety, of that sum per annum.

With respect to the educational objects of the Society, I am at a loss to see what guarantee the public can have as to the extent of chemical knowledge possessed by any individual from the fact of his being entitled to write at the end of his name M.P.S.G.B., when that distinction is obtained by any of us, without regard to qualification, for £2 2s. per annum. Is there not in the educational part of this Society a great resemblance to the Mechanics' Institutes, and Scientific Institutions, of the present day, one or other of which is happily to be found in almost every town throughout the kingdom? Do we look on it as any warranty of a man's possessing mechanical talent, or scientific information, because he is a member of these bodies? Neither would the public be disposed to respect any distinction conferred by a body, not chartered, or recognised, by the Legislature.

Would it not then be far better for the Pharmaceutical Society to abandon their educational project, and restrict their operations to the protection of the trade from the assaults of those who seek to do us wrong, and to become the originators of some bill for the purpose of incorporating the chemists of the united kingdom, enforcing a uniform system of education, and of defining the limits and privileges of the profession? Surely it is better and more creditable to begin the work ourselves, than to let others drag us into some measure of medical reform, wherein we shall perhaps receive just so much notice as is requisite for the purpose of placing us under restrictions and disabilities.

We stand in need of no new establishment for this purpose, the present schools of medicine are sufficient; perhaps the present teachers are sufficient; but the course of chemistry taught to parties intending to qualify themselves for the profession of chemistry, should be more extensive and practical, than that which is now taught the medical student; and is not the present Court of Examiners of Apothecaries' Hall quite sufficient? The first qualification should be the production of articles of apprenticeship, which should have been faithfully served; the fees for lectures should be paid at the time of entrance, and a fee should also be paid to the Hall for certificate at the time of passing.

This plan, or such a one, would possess the advantages of requiring no expensive or cumbersome machinery, for its management; it may be acted on without delay; there requires no outlay for building, &c., &c.; it is calculated to define exactly the limits of the profession, and to wipe away the jealousy which exists in the minds of some apothecaries, towards the present members of the drug trade.

If this plan be objected to, let us take as our model the College of Civil Engineers; except that they fail not to require of candidates that they shall have made themselves practically acquainted with pharmacy, at the counter of some member of the profession.

There doubtless has been a time in the which if the Pharmaceutical Society had been in existence, and its educational objects been fully carried out, it might have saved us from some of the reproach which has been cast upon us: that time is past: we must now adopt more energetic measures; we are assailed from without; let us, therefore, correct whatever is defective within, rather than have the amputating knife used on us by those, many of whom have shewn themselves inimical to our interests.

The apothecary of the present day complains of what he terms the druggists' counter practice; he is jealous because we venture to take upon ourselves the responsibility of prescribing a dose of rhubarb and magnesia, to the child who has eaten too many apples, or an aperient pill and a black draught to the adult: fie on such jealousy!—it can exist only in the minds of the most humble members of the profession; the man of talent should be, and doubtless is, above it. The public is already well protected from any injury at our hands; we are not allowed (under heavy penalties, which would not fail to be exacted) to go out to visit patients; and those who are at all seriously ill will not leave their homes to come to us.

On the paragraph which stands at the head of my letter, and which is from Dr. G. O. Rees' work, it is scarcely worth while to offer any remark; it gives an illustration of the estimation in which the druggists of the present day are held, and I leave those who read it to form their own opinion of its truth, or fallacy; he who can read it without feeling vexed, is possessed of more stoicism than I am.

I am, Gentlemen,
Respectfully yours.
A Country Druggist.

MEDICAL REFORM AS AFFECTS DRUGGISTS.

Edinburgh, Sept. 3, 1841.

To the Editors of The Chemist.

GENTLEMEN :—

Believing your excellent journal to be widely disseminated in this country and in England, I seize the opportunity of so good a medium, to make a few remarks concerning the formation of a society now being firmly established, and to which you are no strangers, namely, the Pharmaceutical Society of Great Britain. I take the liberty of addressing myself to you the more readily, knowing, as I do, the great interest you have always shewn in everything connected with Medical Reform.

I am not aware that your readers in England are acquainted with the circumstance, that here we do not recognize a division (an extensive one with you) of the medical profession, under the name of apothecary. In reality, a surgeon and druggist with us is equivalent to your English apothecary. He attends his patient, and sends from his shop his own medicine, either claiming a fee for attendance and medicine, or making the latter pay for both by charging exorbitantly. Such being the case, the profession throughout Scotland is, or ought to be, divided into physician, surgeon, and druggist.

In many country places, the physician acts as surgeon, and *vice versâ* the surgeon as physician, while it is not unfrequent to find the avocations of a druggist added to the duties of the two former. This gives rise in many towns, to the great annoyance of grocers vending medicines; for as the surgeons aim at an exclusive monopoly, they at once deprive a regularly bred druggist from the chance of success, while they encourage the grocer, from demands made upon him by parties, who, though slightly ailing, are unwilling to employ the surgeon and druggist, until they have tried some of the simple drugs to rally them from their illness. We therefore find a man comparatively uneducated, but who may be able to distinguish moist sugar from sand—indigo from starch—or tea from coffee, become at once a person of education possessing power to discriminate betwixt p. sodæ tart. and p. sodæ carb.—betwixt magnes. sulph., zinc sulph., or acid. oxalic, while they seem intuitively to become acquainted with some prosological table, by which they are enabled to distribute doses for all ages and constitutions.

Whether we have the town or country to blame for the introduction of this system, I cannot pretend to say, but I suspect both are in fault. It is notorious that in such towns as Edinburgh and Glasgow, many families supply themselves with senna, salts, castor oil, &c., from grocers. Now, the grocer sells drugs at a corresponding profit to that which accrues from the sale of sugar and other household commodities, forgetting how small the consumption of the one is compared with the other. He seems to vend it as if cream of tartar was ordered by the hundred weight—castor oil by the gallon—or senna leaves by the stone. I wonder how long a hogshead of cream of tartar, a bale of senna, or a dupper of castor oil would last some of those traffickers in drugs? Let them reflect for one moment on the number of hogsheads of sugar and bales of coffee or chests of tea they get through, ere they dispose of 28lb. of some of their drugs. We all know that it is the heavy trade, the continued demand for his articles, which remunerates the grocer, and not the profits on a small amount. There is a continued consumption and demand for the principal part of his stock, which gives him a quick and ready return; but he seems to forget this, and to sell medicine as if every person were bound to add a dose of salts to sweeten his tea, or castor oil to enrich his coffee.

The absurdity of a grocer vending drugs at the present day, is so glaring, that we might as well have the barber practising the art of surgery, which his pole and brass basin, hanging from the door of his small shop, plainly indicate to have been at one time his sole prerogative.

Independent of the injury done to druggists by this practice, we must not forget that it is far from being unattended with danger to the public. From what I can learn, the Pharmaceutical Society will be able ere long to effect some alteration in this system of things, which is at the present time so great a drawback to chemists in every district of Scotland. This being the case, an association such as the one now forming, ought to receive the cordial support and co-operation of all classes of chemists in particular.

It was with much pleasure that I have observed from time to time, notices in your columns from various cities in England, in connection with the Pharmaceutical Society, and have been much pleased with the manly resolutions proposed and seconded in those meetings; and I must candidly state, that while my eye scanned those lines, I had a feeling of regret, nay of shame, when I searched in vain to find some demonstration of a similar kind from Scotland. The Scotch are proverbially a cautious set; they have the name of being considerate, of being niggard, but then they are allowed to be an educated people—educated I mean as a *nation* compared to other countries: whatever may be the individual intellectual capacity of the inhabitants of Scotland, their numerous and well regulated schools, academies and other places of learning, do every thing to foster and bring forth what may lurk within, and though far

from meaning anything invidious in the assertion, the north side of the Tweed has ever been distinguished from the south, by a kind of substantial knowledge, differing from the more superficial attainments of the English. This will make the circumstance to which I allude the more remarkable, namely, that as yet neither in Edinburgh, Glasgow, nor any of the other Scotch towns, has the slightest notice been taken of the exertions of the society in behalf of our rights and privileges. I question indeed if the society can produce a dozen names as members of the association, in Scotland, certainly not half that number from the capital.

At the very beginning of the Society, a great evil, which threatened to break in upon and destroy our rights and privileges, was prevented by the strenuous exertions of the committee, by successfully opposing the obnoxious bill of Mr. Hawes. Thus gallantly commencing their career of warfare, and having as freely unfurled the banner of justice, they at once held out the hand of good fellowship, inviting all chemists to array themselves in the ranks, and to lend their exertions towards defeating those who would have trampled on and crushed them.

No demonstration, even of good will to the cause, has, as yet, been evinced by us northern people, and we shew an inactivity which is most remarkable. Already in Exeter, where there is a population of only about 28,000, in Worcester, where there are 19,000, in Stafford, where there are 7,000, and in many other places, have the druggists had meetings to promote the views of the society as far as they can.

Let us, on the other hand, look for a moment to Scotland, where we have Edinburgh, population of 136,000, famed for its academies; Glasgow, population 290,000, as famed for its university, from which not the slightest good feeling towards this object has emanated. Let us hope, however, that this state of things may soon be changed, for we may rest assured, that however cramped the Pharmaceutical Society may at present appear, it is capable of raising the standard of respectability amongst our trade, and of promoting our real interests. When we contrast our own state as retail chemists with that of our Continental brethren, it well becomes us to hide our "diminished heads," for, generally speaking, they are well educated men, and as a consequence have aided in bringing to light some of our most valuable and brilliant discoveries in that branch of science with which we are so closely connected.

I well recollect being told by a medical friend, that while travelling in Germany, some years ago, he had occasion to enter a chemist's shop; his description of the shop, compared to our own places of business, was ludicrous enough. The place occupied by this dispenser of drugs, resembled externally, a cellar or place of keeping lumber; upon entering, the interior did not belie the exterior, for every thing was thrown about in confusion, while daylight was but scantily supplied by a small window. In addition to this squalid appearance to the eye, the nasal organs were offended by a most unpleasant odour, so much so indeed as to illicit an exclamation of surprise, followed by a query as to the cause of its production. Judge of his astonishment, when told by the chemist who was putting up the little matter he required, that the smell he complained of was occasioned by the continued evaporation of sea water, to produce BROMINE, which at that time had been only recently discovered, and which very likely was even unknown by name to the generality of retail chemists in this country. This circumstance affords a very good illustration of the manner in which our foreign friends cultivate the science of Chemistry.

Before concluding these remarks, I would mention, with respect, the kind exertions of a young gentleman in the west end of London, who has bestowed (I might say lavishly) time and money in the formation of the Pharmaceutical Association. We are all much indebted to him for his great exertions in our behalf, while he is so well known to all those connected with, or interested in the society, that it precludes the necessity of mentioning his name. My anxious wish is, that he may live to have the pleasing reflection of the result of his endeavours in rearing an institution, which I trust may long exist.

I am sure, Gentlemen, that I have quite trespassed upon your patience, but if it prove of the smallest benefit in attracting chemists here to the subject, it will, I have no doubt, gratify you, while it will very much please,

Gentlemen,

Your most obedient servant,

J. MACKAY, M. P. S.

EDUCATION OF DRUGGISTS.

To the Editors of The Chemist.

GENTLEMEN:—

That pharmacy, considered as appertaining either to the arts or sciences, affords as extensive a field for the employment of talent as any other branch of the medical profession, cannot be doubted; a circumstance which should be borne in mind in the proposed Regulations for the education of the chemist and druggist; at the same time there is a necessary division of labour and talent as connected with the pursuits of the chemist and druggist, which should not be lost sight of, amidst the existing diversity of opinion respecting the amount of scientific knowledge it is essential for the chemist and druggist to possess. That division comprises the manufacturing chemist, the operative

and pharmaceutical chemist, the dispensing chemist and retail druggist, or pharmacopolist, and the wholesale druggist—an arrangement, it will be perceived, quite consistent with an efficient administration of medicine, and acknowledged as such by the public, and also by many of the most liberal and enlightened members of the Colleges of Physicians and Surgeons.

It must be admitted that it can scarcely be necessary for all to attain the same standard of information, neither is it indispensable to securing an efficient performance of the duties connected with the various departments, that each in his individual capacity should possess the whole acquirements embraced in the educational scheme of the society, viz. medical botany, chemistry (both practically and theoretically), materia medica, and pharmacy, together with a knowledge of toxicology.

Respectfully yours,

PHARMACOPOLA.

CHEAP DRUGS.

To the Editors of The Chemist.

St. Marylebone, Sept. 1841.

GENTLEMEN :—

You will do great service to the chemist and druggist, and the public at large, by continuing your wholesome strictures on the baneful and very prevalent system of advertising cheap drugs: a practice alike injurious to trade, the progress of pharmacy, and the cultivation of science, and which, at best, can enrich but few, and that few, at the expense of the whole body, the probable loss of character, and the evident subversion of the trade. The pursuit of pharmacy is altogether incompatible with a competition in the sale of drugs, as far as regards price, independent of the consumption or demand being of such a limited nature as, compared with other necessaries, to render an active or cutting opposition the height of absurdity, and which may be appropriately designated, in the language of your former correspondent, " the ingrafting of medicine upon the sugar tub." It is this mercenary spirit, this hankering after the pounds, shillings and pence, which has hitherto kept the art of pharmacy so much in the back ground, aye! more than all the other causes which have been assigned put together, and which I fear will still prove a stumbling-block to its advancement, unless a better spirit of emulation can be instilled into these destructives, through the influence of example or the instrumentality of your powerful pen, backed by the assistance of others equally desirous of promoting the general welfare and the cultivation of science.

Under the above impression, I beg to call your attention, and that of your readers, to the following advertisement, selected as a specimen of the many of similar pretensions that crowd the columns of the daily papers and other periodicals. " Important to Families and Invalids. — Seidlitz powders for 12 draughts, 1s. per box: carbonate soda, 1s. per pound: tartaric acid, 2s.: Turkey rhubarb, 18s.: effervescing lemonade and ginger beer powders for 18 draughts, 1s. 3d. per box: soda water powders, 24 draughts, 1s.: senna leaves, 3s. per pound: Epsom salts, 6d., 3lbs. 1s.: white tasteless castor oil in pound bottles, 2s. 6d. each. None but first-rate articles kept. Goods sent to all parts daily." The name and address you will observe I have omitted, as doubtless this worthy scion of the trade would like to obtain the insertion of his much respected name, coupled with his paltry advertisement, gratis, in your widely circulated columns, and would console himself with the reflection that it would amply repay him for the exposé.*

The disastrous effects of such a proceeding are too evident to require comment; but I cannot conclude without enquiring what must be the disappointment, to say nothing of the disgust, which the noviciate (who has probably paid from £290 to £300 premium to become acquainted with the art and mysteries of pharmacy) will experience on finding he has to compete with such low characters and ruinous prices as those above quoted. Is it to enable him to compete with such grovelling hucksters as these that he is required to attain a classical education, and devote both money and years to the study and acquirement of botany, chemistry, materia medica, and pharmacy, in addition to the other matters and minutiæ connected with the trade of the chemist and druggist.

It is obvious the sale of drugs ought to be ensured to the Pharmacopolist, and at remunerating prices too, especially if he is not allowed to prescribe; otherwise, I ask, how is he to be supported in the prosecution of his art, or by what is he to be maintained whilst engaged in scientific research; he looks to the profit arising from the sale of drugs as compensation for past and future labor, and whilst devoting his time and talents to the pursuits of the laboratory, he relies upon a well-merited, though hard-earned reward, viz., sufficient daily bread wherewith to supply himself and dependants; for little else, as the trade is now abused and constituted, is he able to procure.

Gentlemen, in conclusion, should the truth of these observations attract your attention, I trust you will use your influence, and as the acknowledged champions of the trade, make every exertion to save the once respectable, I had almost said lucrative, calling of

* This respectable individual has two shops, it is to be observed: one north, the other westward.

the Chemist and Druggist from that perdition to which these dastardly, chandler's-shop-begotten aliens would consign it.

I am, Gentlemen,
Very respectfully yours,
PHARMACOPOLA.

A FEW REMARKS ON THE COMPOSITION AND MEDICINAL ACTION OF PROTO-CHLORIDE OF MERCURY.

BY JOHN MACKAY.

THERE is perhaps no simple or compound medicine more generally used than calomel. From the very earliest times it has been employed alike for both sexes and all ages. Few substances are capable of fulfilling so many different indications according to mode of combination as the above. Amidst its extensive employment it is, however, frequently injudiciously administered. It would appear to be thought by the medium and lower classes a panacea for all complaints; if a child be fretful from cutting teeth, or any other cause, —if it has a severe cold, derangement of stomach or bowels, slight fever, eruption, or any other infantile disorder, away the fond mother sends to the "doctor's" for a calomel powder, and no sooner has the little one swallowed the white powder than for a time her every fear is allayed.

There would appear to be a little mystery concerning the derivation of the cognomen given to the preparation above. The most generally received opinion is, that Sir T. de Mayenne, gave it the name of calomel from his servant who prepared it, being black.

At the present time two methods are employed for the production of this salt; one by precipitation, the other by sublimation. The following diagrams will illustrate the change in both cases. The ingredients are taken in their atomic proportions:—

PRECIPITATION.

60 Chloride of sodium	Chlorine	36	86 Nitrate of soda in solution.		236 calomel precipitated.
	Sodium	24			
262 Proto-Nitrate of mercury	Nitric acid	54			
	Oxygen	8			
	Mercury	200			

SUBLIMATION.

272 Bichloride of mercury	Mercury	200	236 Calomel.	
	Chlorine	36		
	Chlorine	36	236 Calomel.	
200 Mercury		200		

Calomel may be much increased in power, and possess effects upon various organs, according to combination. Thus, it may act as a cathartic, as an aperient, as a diaphoretic, as a sialogogue, as an anthelmintic, as an alterative, and is particularly serviceable in all hepatic affections. It is rarely employed alone, although capable of exerting some influence on the bowels, if given in sufficiently large doses. Perhaps the most efficient mode of inducing peristaltic motion, and thus evacuating the intestinal canal, is to combine this salt with ext. colocynth, aloes, or some other purgative. As an adjunct in cases of this description, calomel is invaluable. A hundred and fifty years ago, it was by no means an uncommon practice to exhibit the chloride of mercury alone in doses of ℈j and ʒss. In such quantities calomel would be apt to exert less powerful effect than when exhibited in smaller doses of from six to eight grains, while, on the other hand, it would be less dangerous to the patient than in ten or twelve grain doses.

At first sight it seems paradoxical that children should be able to bear much larger doses of calomel than adults, but this is strictly true. Neither is it so surprising, when we remember the quantity of mucus generally present in the bowels of children, which of course renders them much less susceptible of the immediate action of this compound.

Caution must also be exercised in the exhibition of this medicine. We well know that there are some peculiarities of constitution which prevent the patient taking more than a single dose of any mercurial, without unpleasant results, nay, I have known a person to be salivated by a single dose of calomel. Idiosyncracy has even prevailed to such a great degree, that the odour of ipecacuan has produced violent emesis. When calomel is injudiciously employed, and the administration of it continued for some time, we have very dreadful results. The capillaries, from being kept in a state of great excitement, soon become proportionally depressed, and while in this debilitated state, not unfrequently take on disease, affecting at one time the skin, at another the mucous membranes, or even the bones. There are few complaints more severe than this, and if once fairly seized on a person, none more difficult to overcome, while it takes such deep root in the system, that many a constitution once robust, strong, and healthy, receives a shake, which the remaining years of life are often unable to restore.

In concluding these few remarks I may give a diagram showing at one view the changes

which occur in preparing calomel as ordered by the pharmacopœia :—

300 Mercury . . . 200 } 236 Calomel.
120 Chloride of sodium { Chlorine 36 } Chlorine 36 . . . . . 236 Calomel..
Sodium 48
296 Bi-persulphate of Mercury { Oxygen 16 } 144 Sulph. of Soda.
Sulph. acid 80
Mercury 200 . . . . . .

The above are placed in an alembic and sublimed. The bi-persulphate of mercury is made by combining the acid and quicksilver, with the aid of heat.

ON THE PROTIODIDE OF IRON AND ITS PREPARATION, WITH FORMULÆ FOR ITS SUCCESSFUL ADMINISTRATION IN CASES OF PHTHISIS PULMONALIS.*

BY DR. DUPASQUIER.

We shall not transcribe the medical considerations which induced Dr. Dupasquier to try the efficacy of protiodide of iron in phthisis, but we may observe, in order to give the following formulæ their due weight, that it seems to result from clinical experiments followed up for six years in the Hotel-Dieu at Lyons, that their application has been attended with very considerable success in the treatment of the invincible malady which they had to contend with.

But it can produce these good effects only when it is completely neutral and in a state of perfect preservation. The solid protiodide of iron of the shops ought to be formed, according to Dr. Dupasquier's investigations, of

Periodide of iron, more or less mixed.
Protiodide of iron, not decomposed.
Sesqui-iodide of iron.
Free iodine.

Now, the latter body, on account of its irritant properties when free, is unfavorable in cases of phthisis. In order to profit by all the advantages attendant on the use of protiodide of iron, M. Dupasquier proposes the following method of using it :—

FORMULÆ.

1st. *Dr. Dupasquier's Normal Solution of Protiodide of Iron.*

R. Iodine..... 10 grammes.
Iron filings.... 20 ,,
Distilled water.. 80 ,,

Dissolve by shaking several times in a matrass held in water heated to 70° or 80° C., but not boiling, in order to avoid the volatilisation of the iodine, which must be left to act on the iron until the liquor is completely decolored. It is in order to render this action more rapid that so great an excess of iron is introduced into the formula.

This preparation should be rapidly filtered, for as soon as it is made, it begins to decompose: "Thus," says Dr. Dupasquier, "practitioners should never prescribe the solution in drops, since it cannot be preserved: neither can it be kept in a draught or drink, for in mixtures of this nature, its alteration is also very prompt." It serves as a basis for the following formulæ :—

2. SYRUP OF PROTIODIDE OF IRON.

R. Normal solution of protiodide of iron ..... 4 grammes.
Colorless and very thick gum syrup .....200 ,,
Syrup of orange flowers.... 50 ,,

Mix thoroughly.

The syrups should be colorless, in order that it may be easy to ascertain whether or not the medicine has undergone any alteration; they should be very concentrated, so that the addition of the solution may not render them too fluid. Every tea-spoonful contains four drops of the solution.

The syrup may be added, but only when about to be used immediately, to milk, gaseous water, barley water, or gruel, &c.

GASEOUS SOLUTION OF PROTIODIDE OF IRON, No. 1.

R. Normal solution of protiodide of iron ..... 1 gramme.
Gaseous water ..... 1 bottle.
Gum syrup..... 80 grammes.

The solution and the syrup are rapidly introduced into a bottle of gaseous water, which is immediately worked and shaken to effect the admixture.

The gaseous waters, Nos. 2, 3, and 4, are prepared in the same way, by adding 2, 3, and 4 grammes of protiodide of iron.

4. MARMALADE OF PROTIODIDE OF IRON.

R. Normal solution of protiodide of iron ..... 15 drops.
Narbonne honey..... 50 grammes.

Mix, and add aromatics, *ad libitum*. One teaspoonful to be taken every twenty-four hours; the quantity of protiodide may be gradually increased.

5. PILLS OF PROTIODIDE OF IRON.

R. Iodine..... 8 grammes.
Iron filings.... 16 ,,
Distilled water.. 25 ,,

* *Journal des Connaissances Medicales*, April 1841.

Prepare in the same way as the normal solution; then filter and pour it into an untinned iron ladle, afterwards adding—

Narboane honey .. 20 grammes.

Evaporate rapidly to the consistence of a clear syrup, and form a mass with—

Gum tragacanth in powder.... 12 grammes.

Make 200 pills, each of which is equal to 4 drops of the normal solution. When these pills are properly prepared and well kept, they ought, on being divided into thin layers, to appear colorless and slightly translucid. "They may," says Dr. Dupasquier, "advantageously be used instead of Vallet and Bland's pills, in the treatment of chlorosis."

6. CAKES OF PROTIODIDE OF IRON.

R. Normal solution of protiodide of iron ..... 20 grammes.

Paste of marshmallow cakes. Q. S. To make 200 cakes,

The solution must be heated in an iron ladle with 30 grammes of sugar, until the mixture acquires the consistence of baked sugar; it is then rapidly incorporated with the paste, and cakes are formed, which should be transparent.

7. JELLY OF PROTIODIDE OF IRON.

R. Normal solution of protiodide of iron ..... 30 drops.

Lichen jelly ..... 100 grammes.

Add the solution to the jelly while liquid, and put it into a cool place to acquire a proper consistence.

8. GLYSTER OF PROTIODIDE OF IRON.

R. Normal solution of protiodide of iron .....15 to 20 drops.

Rather viscous solution of gum arabic ..... 3 pints.

For two injections: one in the morning, the other in the evening.

If these injections cannot be borne, or if they cause too great irritation, from three to ten drops of Rousseau's laudanum must be added.

Whatever mode of administration may be adopted, the normal solution, given first in the dose of 15 drops *per diem*, may be gradually raised to 120 drops in 24 hours.

Dr. Dupasquier associated with this treatment, the employment of tonics, such as Bordeaux wine, Hoffmann's visceral elixir, wine of quinquina, and a strengthening regimen.

To obtain good results, this treatment must be persevered in. Diarrhœa, slight gastric irritation, should not cause its discontinuance. Its use should be suspended only when the oppression becomes very great, and when suffocation is threatened.

MANNA CONTAINING COPPER.*

BY DR. TROBST, GENERAL SUPERVISOR OF APOTHECARIES IN THE DUCHY OF BADEN.

Some time ago manna was brought into sale, marked with spots of verdegris, which indicated its containing copper. It appears to have derived this from being collected in copper vessels. Copper was readily detected by dissolving the ashes of manna in the acids, testing with prussiate of potash, polished iron, hydrosulphuret of ammonia. The presence of copper in manna had, according to Gmelin (*Annalen*, Band xxxiv.), been formally detected by some apothecaries. This impure manna has been withdrawn from commerce in Baden.

* *Annalen der Chimie und Pharmacie*, Feb. 1841; and the *Lond. and Edin. Journal of Medical Science*, No. ix., Sept. 1841.

BOOKS RECEIVED.

"The Oily Acids; forming the first Supplement to the Seventh Edition of Dr. Turner's Chemistry. By Justus Liebig, M.D. and William Gregory, M.D." London: Taylor and Walton, Upper Gower Street.

"Lectures on Chemistry, including its applications in the Arts. By Henry M. Noad, Lecturer on Chemistry." London: R. Hastings, Carey Street; Scott, Webster and Geary, Charter House Square. No. IV.

[We regret being unable to review these works in our present number; we shall do so in our next.]

TO CORRESPONDENTS.

A Subscriber, Cardiff.—That is a matter in which every one must judge for himself; we are doubtful of the utility at so great a distance.

G. O. G.—We think not.

Nota Bene.—*All Communications and Books for Review must be addressed, "To the Editors of The Chemist, care of Mr. Hastings, Publisher, 13, Carey-street, Lincoln's Inn Fields, London." Communications must be pre-paid, and sent before the 15th of each month; Books for Review, before the 10th.*

Advertisers are again reminded of the value of the cover of The Chemist *for all Works, and other Advertisements connected in any way with the Medical and Pharmaceutical Professions.*

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THE CHEMIST.

I. CHEMISTRY.

INVESTIGATIONS CONCERNING URANIUM.*

BY M. EUGENE PELIGOT.

In pursuing the investigations which I undertook concerning uranium, I have arrived at important and unexpected results, which I hasten to communicate to the Academy.

The chemists who have made known the properties of this body, have admitted that the preparation of the free metal is not difficult: indeed, they have given several processes for procuring it: by treating oxide of uranium with charcoal, Bucholz obtained this metal under the form of a grey mass, endowed with a slight metallic lustre: by reducing the same oxide at a gentle heat, by hydrogen, there remains, according to Arfwedson, a brown powder, oxidising in the air, with ignition: the same chemist, with the view of proving that this powder was indeed formed of metallic uranium, endeavoured to obtain the same body by treating with hydrogen a compound which does not contain oxygen,—the double chloride of uranium and potassium: the metal, thus reduced, was presented, after the solution of the chloride of potassium by water, under the form of regular octohedral crystals, endowed with a metallic appearance similar to that of steel. Finally, Berzelius, by heating neutral oxalate of uranium in close vessels, likewise obtained this metal in the free state: the celebrated Swedish chemist considers uranium as one of the most easily prepared metals.

The experiments which I am about to describe, lead to a very different conclusion: it results, indeed, from my investigations,

1st. That uranium is not a simple body, an element, as is at present admitted: this pretended metal contains a large proportion of oxygen:

2d. That the radical of uranium, the true metal, which I have obtained in the free state, presents characters very distinct from those of the present metallic uranium:

3d. That the binary compound which is considered as metallic uranium is a well-defined body, and really acts, in most of the combinations which it forms, the part of a simple body —of an ordinary metal.

In a word, if my experiments are accurate, uranium is a compound metal.

The novelty of these assertions compels me to adduce all the proofs furnished as well by the facts which I have observed, as by those which result from investigations prior to mine.

The action of chlorine on uranium and on its oxides was the point of departure for the new way in which I found myself engaged.

When a current of dry chlorine is passed over these bodies submitted to a red heat, a yellow compound is formed, which is very fusible, very soluble in water, and furnishes by its contact with that liquid a solution which presents all the reactions of the well-known yellow salts furnished by peroxide of uranium: but the action of chlorine is never complete; however long it may be maintained, there always remains a certain quantity of unattacked matter.

Feeling persuaded, at first, that this imperfect reaction was owing to a defect of contact arising from the fusibility of the product formed, which protects from the ulterior action of the chlorine the particles which it covers, I tried this action on oxide of uranium divided by means of charcoal: I was then greatly surprised at obtaining, instead of yellow chloride, a volatile compound, crystallising by sublimation in fine regular octohedral crystals, of a very deep green, endowed with a kind of metallic lustre: this chloride has a great affinity for water, which it evidently decomposes: it furnishes with that liquid a solution of a very deep green, presenting all the different reactions attributed to the salts of protoxide of uranium: these reactions are, consequently, in manifest opposition to the circumstances of the formation of this chloride.

The analysis of this compound presented a

* *Comptes Rendus de l'Académie des Sciences*: No. 8, Aug. 23, 1841.

peculiarity which threw a light on the true nature of uranium.

By treating a certain quantity of it with water, and by pouring into the solution ammonia in excess, the brown precipitate was obtained, which is regarded as formed of hydrated protoxide of uranium: strongly calcined after having been treated by nitric acid, it allowed of my calculating the real weight of the uranium from the quantity of oxygen which it lost under the influence of the hydrogen.

The ascertaining of the quantity of chlorine contained in this compound does not present any difficulty, and is done, as usual, in the state of chloride of silver. In calculating the composition of this body, according to the data admitted by all chemists, it was found that 100 parts furnish 37 parts of chlorine, and 73 parts of protoxide of uranium, which represent about 71 parts of metallic uranium; in other terms, I found that 130 parts of this body yielded 108 parts of these constituent elements, when its elements are brought, by known processes, to a state of isolation.

In the presence of this result, and after having, as may be thought, established the reality and the uniformity of the numbers which I have just mentioned by frequently repeated analyses, it must be admitted that water, in acting on the green chloride of uranium, is decomposed in such a manner that it yields to its metallic radical a certain quantity of oxygen, which the reductive bodies, the hydrogen and charcoal, cannot remove from it; it must be admitted, as a consequence, that this oxygen necessarily exists in uranium, obtained by either hydrogen or charcoal.

The experiment which I am about to relate will show what foundation there is for this hypothesis.

Protoxide of uranium was prepared by strongly calcining perfectly pure nitrate of uranium; the protoxide obtained having been intimately mixed with half its weight of calcined lamp-black, the mixture was submitted, first to a high temperature, then to a current of hydrogen maintained for a long time; as the oxide of uranium, by its calcination with the charcoal, had already lost all the oxygen which the hydrogen had removed from it, no water was disengaged: I had, therefore, doubly realised the best circumstances for acting with chlorine on a mixture of metallic uranium and charcoal: now, from this action exerted by dry and pure chlorine, and carried on in the same tube as had been used in the treatment of the metal and charcoal by hydrogen, there resulted an abundant and complete sublimation of crystallised green chloride, while the collected gases were a mixture of carbonic acid and oxide of carbon; the oxygen of these gases evidently arose, therefore, from the uranium at present regarded as a simple body.

Moreover, no direct experiment having proved the identity of the pulverulent and dull uranium, obtained by charcoal and hydrogen, with the crystallised body with shining facets which results from the decomposition of the double chloride of uranium and potassium, I submitted to the action of chlorine a mixture of charcoal and uranium, obtained by the latter process; the results were the same; the green chloride was formed at the same time as the mixture of carbonic acid and oxide of carbon.

It evidently results, therefore, that the present metallic uranium contains oxygen: it constitutes an oxide of the same nature as the oxides of aluminum magnesium, &c., which are, like it, undecomposable by the isolated action of hydrogen, carbon, and chlorine, while the simultaneous action of the two latter bodies effects the separation of the metallic radical which combines with the chlorine, while its oxygen goes to the carbon.

This fact once established, it became easy to shew that, after all, its physical and chemical properties were, indeed, scarcely those of a true metal. The metallic lustre which it sometimes possesses is rather that of an oxide than that of a metal; for its dust is dull like that of all oxides: although it forms numerous salts endowed with all the properties of ordinary metallic salts, no metal displaces it from its solutions: its specific heat is not in accordance with its atomic weight; its atomic weight, the highest of all known bodies, is by no means borne out by its general characters: put in contact with metals, it does not form alloys: chlorine attacks it but incompletely; sulphur does not exert a direct action on it, while the sulphuret of uranium is produced, according to H. Rose, by the action of the sulphuret of carbon on the oxide of uranium. The formation of sulphuret of uranium under this circumstance, would be one more proof, if required, of the existence of uranium as an oxidised compound.

These anomalies presented by uranium should not have escaped the attention of any chemist: it was they that made me hasten to take the opportunity of studying this body; it was they that lately led Berzelius to distil potassium over uranium: knowing that science had not long to wait for more accurate information concerning uranium, I learnt with some satisfaction that this experiment had given only a negative result.

But uranium being considered as an oxide, differs from all other known oxides by its very remarkable property of combining integrally with several metalloids as a simple body would do; moreover, it forms, in combining with oxygen, an oxide acting the part of a base and forming salts which correspond, as I shall show further on, with the salts formed by oxides which contain one equivalent of oxygen and one equivalent of metal: the metallic

radical of the present uranium, combined with the proportion of oxygen which it retains under the influence of carbon and hydrogen, acts then in the same manner as a simple body: I shall propose for this compound radical, the name of *urania*, henceforth designating by the name of *uranium*, the true simple body, or at least, the undecomposed body, which exists in combination with chlorine, forming the green chloride, and in combination with oxygen, to form *urania*.

For the remainder of this memoir I will employ these two names with the signification I have indicated.

The existence of urania as a compound body being demonstrated, I endeavoured to isolate its metallic radical, and though the attempts to decompose urania by other metals were fruitless, I was able to prepare uranium by decomposing its green chloride by potassium; it is known that by aid of the latter metal and chlorides, metals are obtained which cannot be isolated by other processes.

Two parts of chloride of uranium and one part of potassium, are heated in a small platinum crucible: the affinity of the chloride of uranium for water and that of potassium for oxygen, render it necessary that the experiment be made with rapidity; the action should be very brisk. The crucible and its cover should be fastened together by means of metallic wires.

Under the influence of a very gentle heat, such as that of a spirit lamp, the action is set up; it takes place with such intensity that the crucible becomes quite incandescent, and that a portion of the products may be volatilised by the very high temperature which is developed: it is even advisable, in order to preserve the operator from the attack of the inflamed potassium, to place the small platinum crucible in a larger one: it is also necessary to remove the spirit lamp which heats the crucible at the moment when the action begins to manifest itself, except afterwards to heat it strongly, either to volatilise the potassium, or to give more cohesion to the uranium formed.

By treating the products of this reaction with cold water, the chloride of potassium is dissolved, and the uranium is obtained.

The metal thus prepared is partly in the state of a black powder, and partly agglomerated: by carefully detaching the portions which adhere to the sides of the crucible, small plates are obtained possessing a metallic lustre similar to that of silver, which may be filed, and which appear to have a certain degree of malleability; it is evident that these metallic portions have undergone during the reaction, the commencement of fusion.

Uranium is very combustible; when it is dry, it burns in the air with great brilliancy: when a paper containing some pieces of this metal is subjected to the action of heat, they are seen to burn with a very brilliant white light before the paper itself takes fire. If a dry filter, on which uranium is collected, be shaken near the flame of a taper, the light particles which are detached, appear like brilliant sparks in the heated atmosphere which surrounds the flame.

I do not think that this metal decomposes water at the ordinary temperature, for it appears to exist a long time in the air without undergoing any very sensible alteration; however, when water is poured upon the product of the reaction of potassium on the chloride of uranium, there is a very abundant disengagement of hydrogen, which is attributable, in my opinion, to the decomposition, by water, of an alloy of potassium and uraniaum.

Uranium dissolves in acids diluted with water, with a disengagement of hydrogen; these solutions are green, and present the characters hitherto attributed to the salts of the protoxide of urania.

It combines with chlorine with a great disengagement of heat and light, producing the green chloride.

It also combines with sulphur, in a direct manner, at the boiling temperature of the latter body: the action is accompanied by a disengegement of light.

By this brief exposition, it is shown that the properties of uranium are very distinct from those of urania.

Urania, indeed, is not fusible: in the state of crystalline bractea, it is of a greyish black, and very brittle. The light which accompanies its peroxidation, is scarcely visible; it is not attacked by the dilute acids; it with difficulty combines with chlorine, giving a yellow compound; finally, sulphur has no action on it at any temperature.

The atomic weight of uranium is easily deduced from the analysis of the green chloride; it agrees with that of urania, which I deduced from the saline compounds formed by the peroxide of urania.

Indeed, considering this chloride as formed of two atoms or of one equivalent of chlorine and one atom of uranium, we have, according to the proportion of chlorine—

Cl^2	442·6	37·1
U	750·0	62·9
	1192·6	100·0

The atomic weight of uranium would therefore be 750.

The green chloride of uranium corresponds to the oxide of uranium, which constitutes urania: decomposed by water, it is converted into hydro-chloric acid and urania; by virtue of this equation:

$$Cl^2\,U + H^2\,O = Cl^2\,H^2 + U\,O.$$

100 of green chloride should produce 71·4 of urania, and 37·0 of chlorine; that is to say, 108·4 of products extracted from this chloride, and 111·5 if the urania obtained is

oxidised by nitric acid, and is brought after strong calcination, to the state of protoxide.

The analyses which I made of this green chloride, have constantly furnished these numbers with very great approximation.

Two atoms of uranium, combined with two atoms of oxygen, represent one equivalent of urania.

This equivalent, as shown by the analyses of the acetate and nitrate of urania, which I communicated to the Academy some months since, and to which I shall very soon recur, is represented, at least, in an approximative manner, by 1700:—

U^2	750	× 2 =	1500
O^2	100	× 2 =	200
			1700

consequently, 100 of uranium are combined with 13·3 of oxygen, to form urania.

Urania, in its turn, combines with oxygen in several proportions; it is at present admitted that this body forms two oxides. I think I can show that uranium forms at least five combinations with oxygen.

The compound containing least oxygen is obtained by means of an entirely new reaction.

When a current of hydrogen is passed over green chloride of uranium heated to redness, a portion of its chlorine is removed, and a brown compound, crystallized in very fine prisms, is obtained, which yields with water a purple solution, but which very soon becomes green. This chloride, according to my analyses, contains about 30 of chlorine: it is a sub-chloride of uranium, the composition of which is represented by this formula:—

Cl^3	663·9	30·7
U^2	1500·0	69·3
	2163·9	100·0

the sub-oxide of uranium which is formed when this body is put in contact with water has so great an affinity for oxygen, that it decomposes that liquid at the common temperature, with a disengagement of hydrogen gas; it becomes green, because it is converted into urania.

This disengagement of hydrogen is especially very abundant when the purple solution is put in contact with ammonia: a precipitate of a pear-green color is then obtained, at the same time as the liquor becomes effervescent on account of the escape of the hydrogen: gradually the tint of the precipitate modifies, turns deeper, and finally becomes brown, when the conversion of this sub-oxide of uranium into urania is finished: besides, it is remarked that from the solution of this chloride by water a red powder is precipitated, which is probably urania, whose formation should, according to the formula of this compound, be made at the expence of the oxygen of the air.

Although the existence of this suboxide of uranium cannot be doubted, it does not appear possible to isolate it on account of its great affinity for oxygen: of all the oxides known, it is, I think, the only one that decomposes water at the ordinary temperature.

Protoxide of uranium is obtained, by subjecting the nitrate to a high temperature; according to Berzelius, it should contain 100 of uranium and 3·6 of oxygen; its formula would be—

$$(U^2\,O^2) + O\tfrac{1}{2},$$

if, as I think, the composition assigned to it is only approximative. I can also demonstrate that this oxide does not enter into the composition of the green salts, as was hitherto admitted: the green salts contain, not an oxide of urania, but urania itself, acting as a basic oxide.

I have observed, that on heating to dull redness this oxide, which is black, or indeed urania, in a current of oxygen, or even in the air, it assumes an olive-green color, and absorbs about one per cent. of oxygen; it then presents the character of a saline oxide, of the nature of magnetic oxide of iron, formed by the combination of protoxide of urania with the peroxide. I have not yet finished the examination of this oxide.

As to the peroxide of urania, it is known that no process yields it in an isolated state; but this oxide, the most important of all, constitutes the most easily produced salts of urania, the yellow ones, which, for the most part, crystallize with remarkable regularity.

According to the analysis of these salts, this oxide contains one equivalent of urania, and one equivalent of oxygen: its formula is, therefore,

$$(U^2\,O^2) + O.$$

This oxide corresponds also with the yellow chloride of urania, which is obtained by treating urania by dry chlorine; the composition of this chloride, according to my analyses, is represented by—

$$(U^2\,O^2) + Cl^2.$$

The existence of this chloride of oxide of uranium, that of the double combinations which it forms with the chlorides of sodium and ammonium, the composition of the simple and double salts in which the peroxide of urania replaces the bases formed by one equivalent of metal and one equivalent of oxygen, compel us to consider this oxide of uranium, as holding the place of a simple body in all these saline compounds.

In order to show the necessity of thus looking upon the part acted by urania, it will be sufficient, perhaps, here to detail the formulæ of several of its salts, which I have analysed; the discussion of these formulæ, and the preparation and properties of these bodies, will find their place in the conclusion of my investigations concerning urania:—

Acetate of urania	$C^6\ H^6\ O^6$, $(U^2\ O^2)\ O$, $2\ H^2\ O$;
Nitrate	$N^2\ O^5$, $(U^2\ O^2)\ O$, $6\ H^2\ O$;
Double sulphate of urania and potassa ..	$So^3\ Ko^4$, $So^3\ (U^2\ O^2)\ O$, $2\ H^2\ O$;
Uranite of Autun	$Ph^2\ O^5$, $2\ (U^2\ O^2)\ O$, $Ca\ O$, $8\ H^2\ O$;
Double chloride of urania and potassium	Cl^2, K, $Cl^2\ (U^2\ O^2)\ 2\ H^2\ O$;
Double chloride of urania and ammonia	$Cl^2\ N^2\ H^6$, $Cl^2\ (U^2\ O^2)$, $2\ H^2\ O$;

It is evident that if we consider the salts of urania, as formed by an ordinary metallic sesqui-oxide, the salts which are evidently neutral in their properties, such as the acetate and nitrate of urania, should become basic salts: the neutral sulphate of potassa should be combined in the double salt, with a sub-sulphate of urania; the uranite of Autun, whose composition henceforth becomes so simple by admitting the action of urania as a compound radical, since the composition corresponds with that of ordinary phosphate of soda, would present, in the other hypothesis, the most anomalous constitution: finally, the double chlorides would contain an oxychloride combined with ordinary metallic chlorides. In a word, these various salts would combine the most improbable compositions, I might almost say, the most impossible that could be imagined.

Thus, and without even insisting on this fact, which is not, however, without its value in this discussion, *that urania, a compound body, has hitherto been looked upon as a simple one*, I think that this metallic oxide ought henceforth to be classed among compound radicals, such as cyanogen, ammonium, and binoxide of nitrogen: ulterior observations will prove, without doubt, that other oxides are similarly circumstanced.

Such are the brief observations concerning uranium which I had to communicate to the Academy: it is my intention to continue the study of all the compounds of uranium which I can produce; I have, besides, to conclude the analytical work on the salts of urania, which I commenced some months since: in publishing it, I will show whether the numerical data which I have employed in the work I am going to submit to the Academy, may be considered as definitive, or as presenting mere approximations.

ON THE WATERS OF THE PARISH OF HALIFAX.

BY JOHN S. HILEY, M.B.

I APPROACH this subject with that sort of pleasure which a school-boy experiences on peeping into a newly discovered bird's-nest; or perhaps, more properly speaking, with the thrill of delight, which one feels on visiting an old friend, because it is a department in which I have long taken great interest, constituting, as it does, one of the most characteristic features of this neighbourhood. When we consider the superficial extent of the parish of Halifax, and know that it occupies upwards of 76,740 English statute acres, both the chemist, the geologist, and the statistic must necessarily feel desirous to be rendered familiar with the supply and nature of its springs and streams. These furnish an important addition to every country, and attach that to its topographical history, which it is always proper to understand. In offering, then, to the readers of "THE CHEMIST," a succinct account of the nature of the waters of this parish, I must set out by premising that I will not enter so far into the minutiæ of the subject, as to render the contribution either prosy or tedious. I hope, however, to be borne with while particularizing facts which I may conceive to have some bearing on the question in hand, and which may assist in its better elucidation.

It is a well-authenticated truth, that every hilly and mountainous country abounds in a larger supply of rivers, streams, and springs, than those localities which have a flatter aspect. This district is of the former character, the wildest mountains and moors constituting a notable division of its superficial extent. It is separated from the county of Lancaster by that long line of hills called Blackstone Edge, and by some writers, not inaptly styled the "Back-bone of England."

Amongst these ridges, which are crowned with freestone, many of the rivers and streams which glide down the different fertile valleys take their rise. In addition to the lofty mountains just mentioned, the entire parish would seem to be composed of hill and dale of minor character, amongst which springs of water may be seen oozing out in every direction, and either forming numerous wells for the supply of the adjoining hamlets, or small streamlets which, after meandering for a considerable distance, unite their waters for the formation of broader currents. The great river, however, which runs through this district, and by which it is materially benefited, is the Calder. In fact, the parish of Halifax may in some respects be considered the valley of the East Calder with its numerous branches for the first 18 miles of its course.

In consequence of the almost inaccessible nature of the country through which this river passes, its source, and the origin of its name were for a long time involved in obscurity. According to Dr. Whittaker, in whose opinion I repose great confidence, the word is simply the Danish adjective Kalder, *frigidus*. With its source, the patient researches of more re-

cent travellers in the moorlands have made us comparatively speaking intimate. According to the statements of those who have visited the neighbourhood, the river in question takes its rise in a marsh in Claviger Dean, in the adjoining parish of Whalley, where anciently stood a cross of considerable sanctity, at which pilgrims paid their devotions. In this point, several springs first manifest themselves, and immediately join to form the East and West Calders, which, according as the springs are situated to the east or west of this wild and lofty ridge, run to the eastern and western seas.

The hills constituting this tempestuous and barren region form, as I before stated, what has been called the Back-bone of England, westward of which, the West Calder flows, and after joining the Ribble in Lancashire, enters the Irish Sea. The East Calder, pursuing an easterly direction, after entering the parish of Halifax, flows through the township of Todmorden, and in its course passes down one of the grandest and most romantic valleys in the kingdom, where the scenery partakes more of the character of the highlands of Scotland and Switzerland, than most other places which it has been the lot of the traveller to visit. So narrow is this mountain gorge or valley in some places, the precipices, several of which are more than one hundred yards in perpendicular height, approaching so close, that the canal, the river, the road, and the railway intersect or pass within a few feet of each other. In a word, this valley in every respect, resembles a vast chasm, which has been formed by the sudden separation of its sides, or as if opened by some extraordinary flood.

After winding by several populous hamlets, the river reaches Sowerby-bridge, within two miles of the town of Halifax. From this place it proceeds by Salterhebble, Elland, Brighouse, and Kirklees Park, in the vicinity of which it receives the Colne from the parish of Huddersfield, and, passing onwards by Mirfield, Dewsbury, and Wakefield, reaches Castleford, a village about 3 miles north-west of Pontefract, near to which, it unites its placid waters with those of the more magnificent Aire.

From one to whom the course of this noble river has for a long season been a source of admiration, a passage or two in praise of the scenery connected with it, I am sure will be acceptable. Throughout the whole of this course, the river, particularly in the neighbourhood of Elland, can boast of numerous and almost unparalleled beauties. Along its embankments, where manufacture has not reared its head, the willow, the birch, and the hazel flourish in all their luxuriance, and thus materially add to the beauties of a landscape in many respects unequalled. At a short distance to the right and left of the Calder, along an important part of its route, the ground becomes considerably elevated, and both sides of the valley thus formed, are hung with woods of native oak, not, indeed, of a majestic character, but sufficiently so to have merited the admiration of all who have visited the spot. From the summit of the eminences on either side of the river, we have an extensive view of the stream and the country adjoining, so varied in its character, that we may observe with Kirke White—

> "Above, below, where'er I turn my eyes,
> Rocks, waters, woods, in grand succession rise."

When we regard the route of this enchanting river, it will be at once perceived how important a position it occupies amongst the waters of the parish. And this statement will appear more satisfactory, when I add that perhaps no similar-sized locality in the kingdom can be found, in which are so many other brooks and streams all tributary to the Calder. These amount to nine in number. The first rivulet, to which I cannot ascertain that any name has been affixed, rises in the wild township of Stansfield, and after running between this and Heptonstall, empties itself into the Calder at Mytholm. The second, termed Hebden, or Hepton, rises in the mountains of Heptonstall, and flowing between this and the township of Wadsworth, joins the Calder at Hebden-bridge. The third takes its rise near Blackstone Edge, and after passing through the wild vale of Turvin, and partly separating the townships of Sowerby and Erringden, unites its waters with those of the Calder near Mytholm-royd Bridge. The fourth is a stream from Luddenden, which passing between the townships of Midgeley and Warley, forms a confluence with the Calder at Luddenden-foot. The fifth, the Riburn, which runs into the Calder at Sowerby-bridge. The sixth, the Hebble, formed by the junction of two other streams in Ovenden, which after running and separating the town of Halifax from the townships of North and South Owram, falls into the Calder at Brooksmouth. The seventh is the stream termed Black-brook, or Blackburn, above Elland. This rises in the adjoining parish of Huddersfield, and after winding between the townships of Stainland and Barkisland, empties itself into the Calder near Clayhouse. The eighth is the Red-Beck, which is first seen in North Owram. From this place it courses along, dividing this township from South Owram, and joins the Calder at a place called Brook-foot, below Elland. The ninth is the Clifton Beck. This takes its rise in Shelf, and separates this township from the neighbouring parish of Hartisbead, and, after pursuing a somewhat protracted course, joins the Calder near Brighouse.

Well-watered as the country may be by the Calder and its nine tributary streams, there

are several other still smaller rivulets, to which, however I need not allude. The waters of the first, in consequence of the mills and dyeing-houses which throng most of their embankments, are not always very pure, though some of them, particularly the Calder and Hepton, abound in excellent trout and other fish. In seasons of floods, during which the rain on the surrounding hills, as Boothdean, Blackstone-edge, &c., is generally immense, their waters are so much swollen as in most instances, not only to fill their channels, but likewise to overflow their banks. Scarce a year elapses that the Calder and canal, even where they are widest asunder, do not unite, and this generally occurs in the spring and autumn, about April and November, when the rain is nearly incessant. In the neighbourhood of Elland, the Calder in several points is upwards of 100 yards or more from the canal, and yet I have repeatedly seen the fields between them covered with water to a moderate depth, so that boats have floated from the one towards the other.

A better idea, however, will be formed of the sort of floods which have occurred in this parish by mentioning what has been termed the Ripponden flood. This great inundation happened on the 18th of May, 1722, and it bears ample testimony to all that I have just recounted. Between the hours of three and five in the afternoon, the water in this fertile valley is said to have risen seven yards perpendicular, and to have borne down in its course several bridges, mills, and a number of houses. Many persons also lost their lives on this melancholy occasion. The church was much damaged, part of the church-yard washed away, the graves laid open, and a coffin was lodged in a tree at a considerable distance. It may be observed that this beautiful village occupies a deep recess amongst lofty hills.

On these and similar occasions, the waters of all the streams become extremely muddy, and it is surprising how large a portion of sand, stones, wood, &c., the current will bring along with it. Several of the rivers drain the sandstone formations, others, the mining districts and the coal strata, for which reason these are amply charged with peroxide of iron, whilst the third would seem to receive the waters from the stratified depositions lying nearer the surface.

There are no lakes or pools in the parish. If they ever existed, as there is some reason to believe, they have been long since drained, and converted into valuable land. The moors, however, are not exempt from marshes, morasses, and peat bogs, amongst which there seems to be an abundance of decayed and decaying vegetable matter, in some places amounting to more than four feet in depth. Much turf is annually extracted.

Having thus treated of the running stream in as clear and comprehensive a manner as the nature of the subject would permit, I will now direct my attention in the second place, to the springs, whether simple or mineral, which exist here. I term them simple, because they are not charged with any of those matters, as iron, sulphuretted hydrogen, &c., which usually go to constitute mineral waters, and because they are generally used for all household purposes. This division of my subject will doubtless interest many of your readers, and though it does not come within the sphere of my present design to enter very minutely into the number, &c., of the springs, yet I shall enlarge somewhat on their qualities, properties, and sources.

The whole country is rich in simple waters, which, as is customary, divide themselves into the hard and soft. In addition to these, there are divers mineral waters of a sulphureous, chalybeate or carbonated character, all of which have from time to time been applied with immense advantage in the instances of those whose circumstances would not admit of their visiting the more celebrated watering-places. These will be more fully described afterwards.

The nature of the ordinary springs will be readily conceived by studying the geological relations of collieries, specified in my letter inserted in your last No., for it will at once be seen that the compounds therein contained must be common to a considerable portion of the parish. I may just recapitulate, that salts of potash and soda, gypsum, magnesia, alumina, iron, &c., are all encountered in one or other of the formations, and as such impart a stamp to the numerous springs. The formations alluded to are clay, shale, argillaceous rock, intermingled with marl, lime, magnesia, and iron, the carboniferous system, shale, grit, and sometimes limestone, and lastly, the old red sandstone. According to the absence or presence of any of these, so will the nature of a spring be altered. If the fluid have filtered through quartzy strata alone, where neither gypsum nor saline substances were present, then it is pure and soft, and being impregnated, as most waters usually are, with more or less oxygen and carbonic acid, it is gifted with a most delicious flavour, and is highly enjoyed as a drink. The carbonic acid divests it of that insipidity and nauseousness peculiar to water which has been previously boiled. Should the water have percolated strata containing limestone or gypsum, &c., then it dissolves more or less of these salts, and at once acquires the property of hardness. This kind of water cannot, of course, be employed for most culinary and household purposes, as washing, since it invariably decomposes the soap, the lime of the gypsum contained in the liquid yielding an insoluble compound with the margaric and oleic acids present in the soap. If the water, however, owes its hard-

ness to the presence of carbonate of lime held in solution by free carbonic acid, and thus in other language constituting a soluble bicarbonate of the alkaline earth, then the defect in question is easily remedied by boiling the liquid prior to using it. In this case the free gaseous acid is expelled, and the carbonate of lime thus becoming insoluble, precipitates to the bottom of the vessel, and may be re-moved.

Spring water, nevertheless, contains other ingredients besides those just mentioned, which will be alluded to in their place.

When the water in its passage through the soil and the strata below it, becomes charged with saline and other substances, such as the carbonates, muriates, and sulphates of the alkalies and alkaline earths, oxide of iron, free carbonic acid, sulphuretted hydrogen, azote, and carburetted hydrogen, it is then denominated a mineral spring, and is of course unfit for all domestic purposes. Springs recognizable by each of these three characters (hard, soft, and mineral), are abundantly met with in this parish, and will not require to be further described.

The first, or hard water, as one might expect, and as has been shown, derives its hardness from the presence of carbonate or sulphate of lime. Some springs are particularly hard, and such contain a considerable quantity of the salts alluded to. Besides these, they hold in solution some of the muriates, as those of soda and lime, and a small proportion of iron. Their temperature is about 49° of Fahrenheit throughout the year. They are often deep, the spring in this case being discovered at about 20 yards from the surface. Of course this does not always hold good, for there are many where the waters rise above the ground, and are seldom if ever dry, not even during the longest droughts of summer. The sp. gr. of the hard water rarely exceeds 1·012003. By precipitating the lime with carbonate of soda or potash, it is converted into soft water, and when required for chemical purposes it must be distilled. It is, however, not so generally used either in the arts or manufactures as soft spring or river water, and the reason assigned is its hardness, for it is certainly more abundant than the former.

The soft springs are both superficial and deep. They are very numerous, and of course filter through the more quartzy and granitic strata, and more sandy soil, where little or no lime, either as a sulphate or a carbonate, is met with. These, when superficial, are occasionally dry, or nearly so, during the summer months, whilst the deep wells are in the same condition in this point of view as the hard ones. In both cases, the deep water is obtained by sinking or boring. The soft springs vary a good deal as to softness, particularly those which come near the surface, and several instances have of late years occurred where repairs of many such wells have increased the hardness of the water. This fact may be explained either by imagining that the course of the spring has been somewhat changed, so as to bring its water in contact with minerals which impart the property of hardness, or by the supposition that springs of hard water have been turned into the same channel with the soft. Both cases I know to have happened in this parish, and nothing perhaps will appear easier, when we take into consideration how near, in some places, these different springs are to each other. Thus, one side of a street may yield nothing but hard water, while the other furnishes soft spring alone, or both. The same may be asserted of the two extremities of a village or hamlet, and is repeatedly witnessed in this parish. The temperature ranges between 47° and 52° of Fahrenheit, the heat of those wells being lowest whose waters are never dry. The same spring does not however alter much in this respect by changes in the weather, but preserves a nearly similar degree of heat throughout the year. This, nevertheless, happens only when its origin is in the bowels of the earth. There are divers superficial wells with which I am acquainted, and which are remarkable for their soft character, the temperature of which seldom reaches higher than 46° of Fahrenheit, however hot the summer, nor does it sink lower during the severest winters, thus indicating that the source of the spring is in that stratum, whose temperature is uninfluenced by the warmth of the sun. These springs contain certain proportions of the salts of soda and potash, as the carbonates and muriates, together with a trifling quantity of iron, and the sp. gr. is rather greater than usually happens in other instances, being about 1·02314.—The water itself is of the best kind. There is not the slightest brackishness in its taste, a circumstance probably explicable by the absence of peat bogs, and other places where vegetable decomposition is going forwards. This statement is correct as regards most of the springs in this district, whether hard or soft, and should there be any exceptions, they are found in the vicinity of the Moorlands, where the water contracts a slightly disagreeable flavour in consequence of springing from, or flowing amidst the turf and peat, so very thick in these wild regions. It is probably because of the goodness of the water, that the woollen, worsted, and cotton manufacturers thrive so well, their numerous departments, especially dyeing, having been long pursued with unparalleled success. Some of the superficial springs let fall an ochreous deposit, owing to the prevalence of iron-stone and iron pyrites derived from the coal strata, certain portions of the metal being first taken up as a sulphate or carbonate, both of which afterwards become converted into the peroxide by the action of the atmosphere.

Moreover, the pyritic beds connected with the several copperas manufactures, may and do give a tinge to particular waters. Again, in some localities, the soil itself contains so much peroxide of iron as to impart a considerable quantity of ochre to all the springs and streams adjacent, the contents of which are then vulgarly termed "cankered."—The wells of most note, are St. Helen's Holywell, in Stainland,—the Wood and South End wells, at Elland,—Outram's well, in Greatland,—the Broth-dean Spa, in Rishworth, and other wells in Ovenden. In all of these the water is abundant. It is clear as crystal, and sufficiently impregnated with carbonic acid to render it exceedingly palatable. The wells are for the most part very antiquated, particularly the one in Stainland, their first formation being long prior to the existence of any individual of my acquaintance.

The mineral springs are not so numerous, and are of a sulphureous, chalybeate, and carbonated kind. Amongst the first, may be reckoned the Cragg, in Erringden, and the Spa-well at Elland; amongst the second, the Swift Cross Spa, in Soyland, and the Horley-Green Spa, near Halifax; and amongst the last, the Petrifying Well, near Shelf.

The waters of the Cragg, owe their qualities to the presence of sulphuretted hydrogen in combination with soda. Besides these, they are not perfectly free from some of the muriates, as those of soda, lime, and magnesia. Oxide of iron is also discoverable in small quantity, and I believe the presence of the three gases, viz. azote, carbonic acid, and carburetted hydrogen, has been satisfactorily proved. All these ingredients are detected only in minute portions, and as such the Cragg is more an object of attention to the curious chemist and geologist, than to the physician. It is rarely employed save to make tea, and the fact of its holding in solution free soda, and the several salts just mentioned, renders it well qualified for this purpose, the former extracting more of the coloring and active principle. In no respect, however, is it considered equal to the Spa-well, at Elland. This is of moderate value as a sulphureous water. From a set of experiments which I have recently instituted upon it, it would seem, like the Spa just mentioned, to owe its properties to the presence of hydro-sulphuric acid in combination with sodium. All the other saline contents of the waters of the Cragg, are present here, but in greater abundance, and hence the spring is calculated to be more beneficial in certain cutaneous diseases, &c. Formerly, however, it was much stronger, and evidently held in solution a larger share of sulphuret of sodium, &c. Recent improvements have, nevertheless, either in some measure changed the course of the spring, or have brought about an admixture of its own with the waters from adjoining springs. It may be intimated here, that most, if not all, the mineral waters in this parish contain a more minute supply of saline compounds than they did originally, an assertion in accordance with similar observations made in other places, where mineral waters abound, as at Cheltenham, Scarborough, &c.

These sulphureous waters would seem to flow principally from the coal strata, and as such, the source of their sulphuretted hydrogen, &c., must be sought for in some decomposition in progress amongst the vegetable and mineral matters composing this formation. Doubtless, the iron pyrites, assisted by heat, pressure, and time, will exert so powerful an action upon the surrounding layers, &c., as to occasion the development not only of the hydro-sulphuric acid, but also of one or two other gases, which may be present. I have occasionally employed this water in various cutaneous affections, &c., during my practice in Elland, and with very evident success. Its temperature is about 49·5° of Fahrenheit. Like that from the Cragg, it is exceedingly useful for making tea.

The chalybeate springs, are the Swift-Cross Spa in the township of Soyland, and the Horley-Green Spa, near Halifax. The former is not in any note. It does, however, contain sulphate of iron, lime, and other saline ingredients, together with carbonic acid, and would unquestionably prove useful if a larger share of attention were devoted to it. Experiments have shown that the water is 18 grs. in a pint lighter than at a neighbouring spring. It is indebted for its contents to the soil and strata through which it filters,—these consisting of clay, shale, coal beds, sandstone, grit, &c. The iron is derived from the iron-stone resting above the coal. Though tolerably powerful as a chalybeate, it occupies a very inferior position to the Horley-Green Spa, which is by far the most important of its kind in this parish. The strata adjoining this spring, are rich in all the principles calculated to invest the water with those qualities, which have so repeatedly drawn the attention of men of science to its merits.

Within the last year or two, a beautiful and excellent little treatise on this spa, has been published by my highly learned and respected friend Dr. Wm. Alexander, physician to the Halifax Infirmary. From this work, in order that the reader may be made intimate with the nature of the water, I shall take the liberty of subjoining the analysis, as furnished by my scientific friend, Mr. West, of the Leeds school of medicine and surgery.

Temperature 48·5° Fahrenheit.

In each imperial gallon.

Carbonic acid gas	5·5	cubic inches.
Nitrogen	7·25	ditto
Total	12·75	ditto

Grs.		In crystals.
40·77	sulphate of iron, dry,	or 74·5
15·26	..... lime, dry,	or 19·3
5·	..... magnesia, dry,	or 10·25
·32	chloride of calcium,	or ·59
·93	silica	
1.22	alumina	
66·5		

From the preceding analysis, which I have reason to consider strictly accurate, no one will be disposed to impugn its character as a chalybeate. In fact, few if any of our celebrated watering places, rendered notorious for their ferruginous springs, can produce a well fit to compete with the one in question, as not merely the analysis itself, but the strong styptic, inky taste, can testify. It ought to be remarked that in this case, the iron is combined with sulphuric acid, thus forming a proto-sulphate, in the amount of which it greatly exceeds the springs of Brighton, Cheltenham, Tunbridge, and Harrogate. The Cheltenham spring yields 0·8 grs. of oxide of iron in a pint of water;—the Tunbridge, 2·22 grs. of oxide of iron, in each gallon;—and the Harrogate, 2·40 grs. of oxide of iron, in a gallon also.

In a treatise on the Horley-Green Spa, published by Dr. Garnett, Professor of Chemistry at the Royal Institution, in 1790, an analysis of this spring is supplied, which is however somewhat different to the one furnished by Mr. West. This difference is readily explained by the well-authenticated fact, that certain changes are effected in all springs in the lapse of time, during which their channels become worn away, and their sources mixed with fluids from other springs, thus not only deducting from the sum-total of saline ingredients in any specified quantity, but as a consequence, detracting from its general and therapeutic virtues. The medical properties of this water will be readily understood by referring to the analysis. Here it is seen that the sulphate of iron abounds in the largest quantity, and evidently will, in conjunction with other ingredients, constitute a most admirable chalybeate in all those diseases where such remedies are required. When existing in this state, it is well known that iron is infinitely more valuable as a therapeutic agent, than when found as a carbonate, and hence the superiority of the Brighton and other sulphated chalybeates over the carbonated ones. The origin of the different compounds in the Horley-Green Spa, are perfectly explicable on studying the geological relations of the neighbourhood. Here we have pyrites, calcareous marl, and mill-stone grit, which minerals yield, in one way or another, most of the substances alluded to in the analysis. The nitrogen is most likely abstracted from the atmosphere present in the water. The carbonic acid gas may be evolved during the action of sulphuric acid on the calcareous marl. The sulphuric acid is unquestionably formed by the agency of iron pyrites, water, and air, which, so soon as it is developed, unites itself to the iron, lime, and magnesia comprising the marl, thus giving rise to the sulphates of iron, lime, and magnesia. The muriates, as those of soda, &c., abound so plentifully in primitive rocks, and elsewhere, as to leave little doubt that the chloride of calcium, mentioned in the analysis, originates in some composition of the muriate of soda. The silica is obtained from the mill-stone grit, and the alumina from the clay. We need not be surprised at the abundance of sulphate of iron, when we take into consideration the amount of iron-stone prevalent in the parish.

In former articles, I have stated that scarcely a spring or stream exists in the neighbourhood, where more or less of this important material is not apparent, and in the Horley-Green spa, we find it in the largest proportion. As such, the ochreous deposits of many of the waters meandering through the parish, especially those which arise from the coal fields, are fully explained. This circumstance has given rise to the appellation of "Red Beck" to one of the tributaries of the Calder, mentioned in the earlier part of this paper, and to some other rivulets both in the vicinity of the spa, and elsewhere.

Before leaving the subject of the Horley-Green spa, I may just observe that it was considered by Dr. Garnett, as the strongest chalybeate known. Add to this, such are the encomiums passed upon, and such the virtues attributed to it, by my friend Dr. Wm. Alexander, who has had great experience in mineral waters, that I think it merits the best attention from those whose ailments are likely to be benefited by solutions of iron. It is situated in a most delightful part of the country, being surrounded on all hands with that sort of scenery which would afford enjoyment and relaxation to the mind, and which would keep the attention from brooding over the maladies with which the sufferer was afflicted.

I must now offer a few brief remarks on the carbonated waters of this parish, of which we have only a single instance in the petrifying well, at Shelf. Here, in consequence of the lime stone in the different strata, and the excess of carbonic acid evolved by various chemical actions going forwards in the bowels of the earth, as that of sulphuric acid upon carbonate of lime, we have a bi-carbonate of lime generated, wholly soluble in the waters of the spring. Or again, the carbonate of lime may be dissolved by an excess of carbonic acid in the fluid, thus producing the same effects as in the first instance. The water, while running along its channel, or trickling from the sides of the well, becomes, in the course of its exposure to the atmosphere, deprived of its su-

perabundance of carbonic acid, and as a consequence a large portion of the carbonate of lime previously dissolved, precipitates to the bottom, or upon any substance which may be in its way, thus forming those various petrifactions, so much admired by the curious. The waters at Shelf are nevertheless a considerable period in effecting any change of this kind, in consequence of the small proportion of carbonate of lime with which they are impregnated. As such, they are infinitely inferior to the dropping-well at Knaresborough.

The phenomenon in both is explicable by a similar course of reasoning. At Knaresborough, the spring issues from a lime-stone rock in the steep declivity of a hill, which occupies the south-western bank of the river Nid. After running about twenty yards towards the river, it spreads itself over the top of another rock, from whence it trickles down in about thirty places, and is accompanied with a musical or tinkling sound in its descent from one ledge to another, and from thence into the waters below. The front of this during the last summer was hung over with plants, flowers, shrubs, birds, and other articles, for the purpose of becoming enveloped in calcareous matter. The water, as it slowly trickles over them, or is evaporated, leaves behind more or less of the carbonate of lime, which it holds in solution, and thus are formed the various incrustations in which visitors take so much interest. The space required for effecting a perfect incrustation upon any article, depends somewhat on its size, but I learned on the spot, that in no period under twelve months could it be fully accomplished. The stalactites deposited here are both numerous and beautiful. When smoothly cut through, in consequence of the iron which they contain imparting to them a brownish color, they admit of most splendid polish, and thus many elegant ornaments, are cut out of them for sale. The water also is charged with magnesia, which doubtless has its share in forming the petrifactions. Petrifying wells are by no means rare. In the joinings of arches thrown up in the construction of railways, stalactites are repeatedly deposited, which hang from the top not unlike icicles. The lime in the soil above, and of the mortar contained in the masonry, is apparently dissolved by the carbonated water which trickles through, whilst the latter, in consequence of its sluggish motion, is evaporated, leaving a stalactite of variable and constantly increasing length. Before concluding, I may just observe, that I have occasionally detected small proportions of free sulphuric acid in the running streams hereabouts, the origin of which was sufficiently explained, whilst discussing the nature of the Horley-Green Spa.

After thus briefly treating of the springs and streams of the parish of Halifax, I feel persuaded that the facts here adduced and established, cannot but draw the attention of every reader to this conclusion, viz., that few other localities in Great Britain, can boast of equal advantages in their supplies of this necessary beverage, whether as a therapeutic or domestic agent. Add to this, its various applications in the arts and manufactures which are here carried on, and the value which is attached to it by those who have occasion to employ it in the processes of dyeing, washing, &c.—all bear ample testimony to this truth, that if abundance of water is required, remarkable for purity or any other property, whether medical or otherwise, it will, with few exceptions be found by the speculator, in the parish of Halifax.

JOHN S. HILEY, M.B.

Elland, near Halifax,
Oct. 7, 1841.

LIMITS OF THE SENSIBILITY OF CERTAIN REAGENTS.*

BY DR. HARTING.

I. SENSIBILITY OF STARCH AS A TEST FOR IODINE.

BY preparing a series of solutions, more or less diluted, containing iodide of potassium, slightly acidulated, I obtained the following results, after adding a weak solution of starch :—

No.	Prop. of iodine.	Color of the precipitated Starch.
1.	$\frac{1}{500}$	Black; supernatant liquor, yellow and brown.
2.	$\frac{1}{1000}$	Nearly the same color.
3.	$\frac{1}{2000}$	Same colored precipitate; liquor very slightly colored.
4.	$\frac{1}{3000}$	Blueish black; liquor almost clear.
5—6.	$\frac{1}{5000}$	Blueish black; liquor quite clear.
7—11.	$\frac{1}{10000}$	Very deep blue.
12—15.	$\frac{1}{20000}$ — $\frac{1}{30000}$	Blue, with a violet tint.
16.	$\frac{1}{150000}$	Upper layer, violet; lower layer, rose-colored.
17.	$\frac{1}{175000}$	All the precipitate rose-colored, with a violet tint.
18—19.	$\frac{1}{200000}$	Rose colored, but only the upper part.
20—22.	$\frac{1}{300000}$ — $\frac{1}{400000}$	The whole of the precipitate had a slight rose-color.
23—25.	$\frac{1}{450000}$ — $\frac{1}{500000}$	Upper layer of the precipitate, light rose-color; the lower one, white.

Up to No. 19, the re-action took place immediately after the addition of the starch; the

* *Bulletin des Sciences physiq. et natur. en Neërlande.*

subsequent Nos. required some time; the two last, containing $\frac{1}{200000}$ and $\frac{1}{250000}$ of iodine, presented no change of color for some hours.

II. TESTS FOR ACIDS.

1. *For sulphuric acid*:—

Syrup of violets does not detect beyond $\frac{1}{250}$ of sulphuric acid of sp. gr. 1·829:

Subcarbonate of soda, gives a slight effervescence with $\frac{1}{250}$:

Paper stained with an aqueous solution of Fernambouc, does not act beyond $\frac{1}{100000}$:—that dyed with tincture of red cabbage, is slightly reddened by $\frac{1}{150000}$:

Hœmatosine (Campeachy wood) immediately takes a yellow color with $\frac{1}{200000}$:

Paper dyed with the aqueous tincture of turnsole, is immediately colored by $\frac{1}{3000}$; and, after an hour, very slightly by $\frac{1}{50000}$:

Sulphuric acid of the above sp. gr. contains, according to Dr. Ure, 75·83 per cent of anhydrous acid.

2. *For phosphoric acid*:—

Paper stained with the aqueous tincture of Fernambouc, or with red cabbage, will detect $\frac{1}{10000}$ of anhydrous phosphoric acid:

Turnsole paper reddens immediately with $\frac{1}{10000}$, and after an hour with $\frac{1}{80000}$.

III. REAGENTS FOR VARIOUS ACIDS.

1. *For sulphuric acid*.

a. For free sulphuric acid:—

A concentrated solution of chloride of calcium precipitates, at the end of a few hours, with $\frac{1}{250}$ of sulphuric acid of sp. gr. 1·829:

A solution of acetate of lead gives a precipitate with $\frac{1}{200000}$:

Chloride of borium detects $\frac{1}{200000}$:

b. For sulphuric acid combined with a base:—

Acetate of lead renders turbid a solution of sulphate of soda containing anhydrous sulphuric acid in the proportion of $\frac{1}{35000}$:

The solution of chloride of barium precipitates $\frac{1}{25000}$ of this acid contained in the solution of the same salt.

2. *For nitric acid*:—

By means of hydro-chloric acid and a small piece of gold leaf, I have been able to detect $\frac{1}{250}$ of nitric acid of sp. gr. 1·32. The gold leaf was not dissolved for four hours.

3. *For phosphoric acid*:—

The acetate of lead immediately precipitates the liquid containing $\frac{1}{10000}$ of anhydrous phosphoric acid, and after half an hour, that containing $\frac{1}{50000}$:

Lime water renders turbid the solution of $\frac{1}{10000}$ of this acid, and after an hour that of $\frac{1}{50000}$ also presents a slight precipitate:

The solution of the chloride of barium does not precipitate more than $\frac{1}{10000}$ of phosphoric acid.

4. *For arsenious acid*:—

Lime water added in excess, detects $\frac{1}{2000}$ of this acid dissolved in water:

The ammoniacal solution of copper shows the presence of $\frac{1}{3000}$:

Hydrosulphuric acid, dissolved in water, produces a precipitate with $\frac{1}{36000}$ of arsenious acid:

The ammoniacal nitrate of silver gives a lemon yellow precipitate with $\frac{1}{30000}$ of this acid: this color is not distinct in more dilute solutions.

IV. TESTS FOR METALS AND THEIR OXIDES.

1. *For free alkalis in general*:—

Paper colored with the aqueous tincture of curcuma denotes the presence of $\frac{1}{3000}$ of caustic potassa:

That of red cabbage detects $\frac{1}{7500}$ of the same alkali:

That of Fernambouc is colored of a light violet with $\frac{1}{20000}$:

The blue color of turnsole paper, reddened by acetic acid, is returned by $\frac{1}{25000}$ of potassa.

2. *For potassa*:—

The alcoholic solution of chloride of platinum precipitates a solution of nitrate of potassa, containing $\frac{1}{25}$ of that base, but has no effect on that which contains only $\frac{1}{250}$:

A very concentrated solution of tartaric acid detects $\frac{1}{250}$ of potassa, but does not act on $\frac{1}{250}$:

The sensibility of these reagents was examined at a temperature of 12° C.

3. *For lime*:—

Oxalate of ammonia renders turbid, after a few moments, in a very perceptible manner, a solution of chloride of calcium which contains $\frac{1}{100000}$ of lime.

4. *For baryta*:—

Fluo-silicic acid slightly precipitates a solution of barium, which contains $\frac{1}{2000}$ of that base:

A solution of sulphate of soda, after half an hour, detects $\frac{1}{71000}$:

Fluo-silicic acid is a very certain test for distinguishing soda from potassa by aid of the microscope. The precipitate obtained in solutions of potassa, free or combined, is presented to the microscope under the form of gelatinous masses without any crystalline texture, while the precipitate with soda or its salts is always in beautiful hexagonal crystals.

5. *For magnesia*:—

The solution of subphosphate of ammonia detects in a solution of sulphate of magnesia, after 24 hours, $\frac{1}{100000}$ of magnesia, provided that the test be very concentrated and added in quantity equal to the liquid under examination:

Liquid ammonia gives rise, after a few minutes, to a slight precipitate in a solution of the same salt, containing $\frac{1}{2000}$ of magnesia.

6. *For iron*.

a. For the protoxide:—

The tincture of galls and the solution of deuto-cyanuret of potassium and iron, acidulated by a few drops of hydrochloric acid demonstrate, after a few minutes, in a solution

of crystallised protosulphate of iron, the presence of $\frac{1}{125000}$ of protoxide.

b. For the deutoxide:—

The tincture of galls imparts a slight violet tint to a solution of deuto-sulphate of iron containing $\frac{1}{200000}$ of deutoxide:

The proto-cyanuret of potassium and iron detects $\frac{1}{125000}$ in a solution of the same salt.

7. *For copper*:—

Liquid ammonia imparts, after some hours, a slight blue tint to a solution of deuto-sulphate of copper containing $\frac{1}{5000}$ of deutoxide of that metal:

Proto-cyanuret of potassium and iron shows $\frac{1}{75000}$ of that oxide in a solution of the same salt:

Well-polished iron demonstrates $\frac{1}{125000}$ of deutoxide, or $\frac{1}{125000}$ of metallic copper in a similar solution acidulated by one drop of nitric acid.

8. *For lead*:—

A plate of zinc precipitates the lead contained in a solution of nitrate of lead in which there is $\frac{1}{2000}$ of the protoxide.

9. *For silver*:—

Chromate of potassa produces a red precipitate in a solution of nitrate of silver containing $\frac{1}{1000}$ of oxide: there is no reaction beyond $\frac{1}{20000}$:

Arseniate of potassa gives a very distinct yellow precipitate with $\frac{1}{5000}$, but does not act beyond $\frac{1}{10000}$:

Iodide of potassium produces a yellow precipitate with $\frac{1}{1000}$, and nothing beyond $\frac{1}{20000}$ of oxide:

Hydro-sulphuric acid, dissolved in water, precipitates $\frac{1}{10000}$:

Chloride of sodium immediately renders turbid a solution containing only $\frac{1}{12000}$ of oxide.

ON THE MANNER IN WHICH ALLOXAN ACTS WHEN BOILED WITH WATER.*

BY MM. WOHLER AND LIEBIG.

If a concentrated solution of pure alloxan be submitted to ebullition, it immediately disengages carbonic acid gas: this disengagement lasts for a long time. It then gives with beryta a deep blue precipitate, and with carbonate of ammonia an abundant crystallisation of murexide. It deposits while cooling, and even during ebullition, a great quantity of alloxantine, of which it previously presented not a trace, which explains the production of the murexide. If the supernatant liquors be saturated by ammonia, oxalurate of ammonia is obtained.

Three atoms of alloxan give:—

2 at. alloxantine	=	$C^{16}\ H^{10}\ N^{2}\ O^{10}$
1 at. parabanic acid	=	$C^{6}\ H^{2}\ N^{4}\ O^{6}$
2 at. carbonic acid	=	$C^{2}\ \ \ \ O^{4}$
		$C^{24}\ H^{12}\ N^{12}\ O^{20}$

ON THE SALTS OF PROTOXIDE OF MERCURY.†

BY H. ROSE.

The fixed alkalis have rightly been considered the most energetic of all bases. Besides this basic energy, they present other properties which are unconnected with it; but it has long been thought that they must necessarily belong to all energetic bases, and the only reason for this opinion is, that they had been observed in the alkalis.

The oxygen in the alkalis is intimately connected with the metal: the difficulty of reducing the metal was long considered an essential property of an energetic base. It is only lately, and after much prejudice, that chemists have decided on admitting oxide of silver as an energetic base; the weak union of silver and oxygen in the oxide being the only reason. But the properties of oxides of forming weak or energetic bases, and of more or less powerfully retaining oxygen seem to be independent. In a great number of oxides, as in many earths, the oxygen can be separated from the metal only with the greatest difficulty, and sometimes even incompletely, and still these oxides often belong to the weakest of all bases.

The property of oxides of forming energetic or weak bases most frequently depends on the number of atoms of oxygen with which one atom of the metal combines. The basic properties of an oxide are so much the more energetic as the number of atoms of oxygen is less comparatively with those of the metal with which it is combined. The protoxides of copper and mercury, which seem generally to be ranked among weak bases, would appear to make the only exceptions to this rule: but these exceptions are only apparent; for these two oxides possess peculiar properties, which have no connection with their basic property, but which cause them to be considered weaker bases than they really are.

A long time ago, I endeavoured to show that oxide of silver should be regarded as a combination of one atom of oxygen and two of metal. More recently, M. Regnault, in his investigations concerning the specific heat of simple and compound bodies, confirmed this opinion, and found at the same time that the fixed alkalis ought, for the same reasons, to be composed, like oxide of silver, of two atoms of metal and one atom of oxygen; and the fact discovered by M. Mitscherlich, that

* *Annalen der Chemie und Pharmacie*, Vol. xxxviii. page 357.

† *Journal de Pharmacie, Sept.* 1841.

several salts of silver are isomorphous with the corresponding salts of soda, leads to the same conclusion.

We must therefore admit in the alkalis and oxide of silver the same composition as in the protoxides of mercury and copper, and the latter should consequently belong to the more energetic, although they have hitherto been regarded as weak ones.

It is generally stated in chemical works, that the protonitrate of mercury is decomposed by water into a basic salt. If this were true, we should not hesitate to class protoxide of mercury among the weak bases, for water can separate none but weak bases from salts, since in this case it fulfils the part of a base, and precipitates, in the state of an oxide or of a bibasic salt, those bases which are weaker than itself.

There are particularly only bases formed of a double atom of metal and three atoms of oxygen, which water separates from their salts, and, of the great series of oxides formed of one atom of metal and one atom of oxygen, the deutoxide of mercury which is evidently the weakest base of all, is the only one decomposable by water; as for the protoxide of mercury, this property belongs to it only in appearance.

It has long been known that the protoxides of copper and mercury possess the property of being decomposed, under the influence of several reagents, into metal and an oxide containing more oxygen. It is this property, and that of acquiring more oxygen from the air (properties which are independent of their basic functions), which have caused it to be erroneously supposed that the salts of protoxide of mercury are decomposed by water like salts of weak base; indeed, these protoxides retain the same properties in their salts, and hence the production of deceiving phenomena.

It is a very old observation, that in the preparation of sulphate of copper by the calcination of copper with sulphur and the lixiviation of the calcined mass by water, there is dissolved with the sulphate of deutoxide of copper, some sulphate of protoxide; the latter is slowly decomposed in the solution into sulphate of deutoxide and metallic copper, which may furnish very considerable masses in the manufacture of sulphate of copper.

All the salts of protoxide of mercury present a decomposition similar to that of sulphate of protoxide of copper, but in a different degree. We obtain, when they are heated by water, metallic mercury mixed with undecomposed salt (which is, in most cases, very little or not at all soluble), and a salt of deutoxide. But the latter is in its turn decomposed by water, and often produces a basic salt. If nitrate of protoxide of mercury be boiled with a large quantity of warm water, there separates, besides metallic mercury, a crystalline salt, not very soluble, and of a lemon color, which is again decomposed by boiling with a greater quantity of water, and which has been regarded as formed partly of nitrate and partly of basic nitrate of protoxide of mercury; it is, however, a double salt of nitrates of deutoxide and protoxide of mercury. One proof that the protoxide of mercury is an energetic base is, that it forms with carbonic acid an anhydrous neutral salt (very easily decomposed, it is true)—a property which belongs only to very energetic bases; in general, it forms with even very weak acids better defined combinations than some which are ranked among energetic bases.

The combinations of protoxide of mercury, with most of the organic acids, very much resemble those formed by oxide of silver with the same acids: these salts are among the least soluble: however, those of protoxide of mercury are less so than those of oxide of silver.

ON THE OXYDATION OF ALCOHOL BY CHROMIC ACID.*

BY DR. RUDOLPH BÖTTGER.

It is a well-known fact, that spongy platinum, peroxide of manganese, and other spongy bodies, according to Döbereiner's experiments, have in certain conditions, the power, by developing the oxygen of the air, of oxydizing alcohol, and converting it into a peculiar fluid containing aldehyde, which has received the name of lampic acid. The other conceived that a similar oxydation of alcohol might be affected by means of chromic acid, which, it is well known, readily yields to many substances a portion of its oxygen. It has hitherto been supposed, that chromic acid is soluble in alcohol, and that the solution is decomposed by light and heat. According to Dr. Böttger's experiments, alcohol is immediately decomposed by dry chromic acid, and as will appear from the sequel, not unfrequently with powerful development of light and heat. If dry chromic acid is thrown into absolute alcohol, it is immediately deoxydated with the evolution of powerful heat (*unter heftigerm glühen*), whilst the developed oxygen, at the moment of its separation, combines with the alcohol, and converts it immediately into the aldehydic fluid, which is at once recognized by its highly penetrating odour. If about a teaspoonful of dry chromic acid is placed in a porcelain capsule, and moistened with a few drops of absolute alcohol, the latter is immediately inflamed, whilst the reduced portion of the chromic acid becomes red hot for a considerable time. If the absolute alcohol is mixed with a little sulphuret of carbon, a fluid is formed which catches fire on the

* *Annalen der Chemie und Pharmacie*, January, 1841.

contact of the smallest portion of chromic acid, whilst sulphuret of carbon alone, is not in the least affected by chromic acid.

If a clean glass vessel, capable of containing a pound of water, is filled with a mixture of atmospheric air and vapour of alcohol, and a few grains of dry chromic acid are thrown into it, immediately an explosion occurs, which, however, is quite free from danger if the mouth of the vessel be left open. If, after the explosion has occurred, we introduce as quickly as possible, a few drops more absolute alcohol, with as much chromic acid as will lie on the point of a knife, and shut the vessel, if the atmospheric air has all been expelled by the explosion, the decomposition of the chromic acid and alcohol, goes on in a quiet but very interesting manner. If the experiment be conducted in a somewhat darkened room, we observe the developed oxyde of chromium, in a fine state of division, and incomplete incandescence moving about in the glass. The most common appearance is that each particle of oxide like a glowing meteor, curls round on its axis with inconceivable velocity, and continues in this state of motion and incandescence in the newly formed aldehydic atmosphere, so long as the least particle of undecomposed alcohol remains in the vessel. The author has frequently observed, even in day-light, this remarkable appearance last from eight to ten minutes.

LONDON ELECTRICAL SOCIETY.—OBSERVATIONS ON THE ELECTRICAL EFFECTS OF THE GYMNOTUS.

At the Meeting, on Tuesday the 19th ult., the Secretary read before the Society a Translation of a paper on this interesting subject by Prof. Schönbein. The object of the writer was to trace the extent of our acquaintance with the causes which operate in producing the peculiar powers possessed by this fish. He shewed that neither the physical nor the mechanical structure of the electric organ can account for this; and that, though this organ is in some degree analogous to Volta's pile, yet by its very nature it falls immeasurably below that formidable arrangement. That no artificial combination of such substances, as form the organ, will produce effects worthy of comparison with the feeblest results of metallic arrangements; that even if the action were traced to something similar to Volta's pile, yet the analogy could not hold good, seeing that the said organ is always immersed in a solution, which forms a medium of connection between the two poles, and yet, contrary to all known laws, no discharge takes place. The author then dwells at great length upon the intimate connection between this power and vital action; and clearly illustrates by fact and analogy every position he assumes. The paper extends to some length; but no paragraph could be omitted without disjointing the well devised adjustment of the whole. The modesty with which the Professor confesses how little we really know of this abstruse subject, affords an admirable lesson to those would-be philosophers who fancy that by a mere superficial glance, or by an inspection of but one feature of a subject, they have obtained a knowledge of the whole.

Then was read "An Account of Experiments with a Water Battery." By H. M. Noad, Esq., Mem. Elec. Soc. Mr. Noad prepared a series of 500, contained in green glass tumblers, insulated on strips of walnut-tree wood, supported by glass legs. These are a portion of 2000, which he intends arranging. The insulation was not perfect, even with these precautions; indeed, when so great a degree of tension is obtained—a tension closely allied to that of common electricity—it is next to impossible to obtain perfect insulation. The only feasible plan of effecting this is, in the author's opinion, to mount *each pair* on a varnished glass pillar—a plan, as he remarks, involving an expense not altogether acceptable to a private individual. We must refer to the Proceedings of the Society for an account of the effects of this arrangement.

The Secretary then laid before the Society Mr. Weekes's Register, for the month of September.

REVIEWS:—

THE OILY ACIDS; *Forming the first Supplement to the seventh edition of Dr. Turner's Chemistry.* By Justus Liebig, M.D. Professor of Chemistry in the University of Giessen, and William Gregory, M.D., Professor of Chemistry, King's College, Aberdeen.

We congratulate our readers and all interested in the science of chemistry, especially that part of it which relates to organic matter, on the appearance of the first supplement to the late Dr. Turner's Elements, edited by Professor Liebig, of Giessen. To those who may have been of sufficiently long standing to be acquainted with the state of organic chemistry, forty years ago, a work such as that now before us must prove a most gratifying bequest. It may with truth be said that this once abstruse and hopeless subject is now established on as firm a basis, and its laws traced with as much certainty and accuracy as those which cause and regulate the actions and changes of inorganic matter. For most of those invaluable discoveries which are the subjects of this volume, we are in a great measure indebted to our Continental brethren. The names of Chevreul, Gay Lussac, Bra-

connot, Boudet, Poutel, Laurent, Frémy, and particularly of Liebig, must ever be distinguished in this branch of chemical science.

This supplement is not more conspicuous for the excellent arrangement of its subjects and the accuracy of its deductions, than for the clearness of its language and neatness of its style.

In the section "on the action of nitrous acid on oils," some very important results are detailed, which we are enabled fully to confirm from those obtained by ourselves several years ago, during some very extensive experiments made with nitrous acid, both alone and in combination with other agents, particularly such as readily yield oxygen.

Many very valuable facts are developed in the chapter on the action of metallic oxides on fixed oils and fats. By the combination of these bodies with oils, two kinds of compounds are formed, soaps and plasters. Until the time of Chevreul, the process of soap-making was entirely empyrical, and the maker completed his operation through skill acquired by practice, and not by any certain guide or rule. We agree with Professor Liebig, in the observation that "soap-making may now be considered as one of the arts most thoroughly understood." The cause of the great advancement in the knowledge of this art, is the discovery by Chevreul of the changes, or rather, developments, which take place during the process.

"Chevreul showed that the different kinds of fixed oils and fats contained three distinct compounds, united in the most various proportions: one, liquid at ordinary temperatures, which he called oleine; and two solid, but differing in fusibility, stearine, and margarine.

"He also showed that three of these contained oxide of glycerule, (glycerine,) in combination with an oily acid; and that when the oil or fat was acted on by the alkalies, or by oxide of lead or zinc, these bases united with the oily acids,—forming in the first case, soluble soaps; in the other, insoluble plasters. The oxide of glycerule in the moment of separation united with water, forming hydrated oxide of glycerule, (glycerine, or sugar of oils.) When the weight of the glycerine was added to that of the oily acid, after the latter was separated from the bases, their united weights exceeded somewhat that of the original oil; which he showed to arise from the fact, that both the oily acids and the glycerine, when separated from other substances, combine with water. With ordinary oils and fats no other products are formed; but when the oil or fat contains any of the volatile oily acids, such as butyric or phocenic acids, the soap contains a salt of the volatile acid, and acquires its smell.

"Soaps are divided into *hard* and *soft soaps*. The former are obtained from fats or oils; the latter from drying oils. Of the hard soaps, those containing soda are firmer than the soaps of potash. Of the hard soaps of commerce, those made with vegetable oils are mixtures of oleate and margarate of potash or soda; those made with animal fats are mixtures of stearate, margarate, and oleate of potash or soda.

"In order to form soap, the oil or fat is boiled with a solution of caustic potash or soda, till the whole forms a thick viscid emulsion, which can be drawn out into long clear threads. If not clear, either water or alkali must be added, according as the turbidity depends on undecomposed oil, or on a deficiency of water. When the saponification is complete, the next step is to separate the soap from the excess of alkali, the glycerine, and the superfluous water. This may be effected by boiling down till the alkaline ley becomes very concentrated, when the soap becomes insoluble, and rises to the surface. The same end is attained by adding very strong ley, or common salt, both of which render the soap insoluble in alkaline ley of a certain strength, as well as in a solution of common salt. The separation is known to be complete when the liquid ceases to froth when boiling; and the soap is ladled off into moulds, where it is well stirred to favour the separation of the liquid, which should run off from its surface like water from fat. The soap brought to this state in the first operation is called *grain soap*, from its separating in grainy particles at first. It may be further purified by repeating the process of dissolving it in alkaline ley, and separating it by the addition of salt. In this process the impurities subside, and the soap generally takes up more water; so that, although whiter, it is less strong. White soap, for example, commonly contains 45 to 60 per cent. of water, while grain soap only contains 25 to 30 per cent. No doubt it might be again procured with as little water as at first; but it is the fluidity caused by the additional water that allows the impurities to subside, and the soap to become white. What is called marbled soap is grain soap which has not been subjected to purification; and the grey, blue, and green colors in it arise principally from the presence of insoluble soaps of oxides of iron or of copper.

"It is to be observed, that when common salt is added to the solution of a soap of potash, the latter is converted to soda soap, entirely or partially, according to the quantity of salt, while chloride of potassium is formed. As this latter salt does not cause the soap to separate, like common salt, it is necessary to use twice as much salt to separate the soap when it has been made with potash.* If a

* Our friend Mr. Sturtevant, of London, has lately taken out patents for making soap without separation of leys, and finds that by

soap of potash be required, it must be separated by caustic potash. In Germany, soda soap is first made with potash, and the potash soap is decomposed by common salt. In England and France, soda soap is made directly with caustic soda.

"The use of salt in this important process depends on the curious fact, that soap, like muscular fibre or animal membrane, cannot be moistened by a saturated solution of salt; that is, cannot deprive it of water. On the other hand, if these substances be moistened with water, or dissolved in it, the addition of dry salt in sufficient quantity will remove the whole of the water.

"Soft soaps are made with drying oils, either alone, or mixed with train or other fat oils. They are insoluble in strong alkaline ley, and are separated from water by the addition of potash or soda. When train oil is added, they have the disagreeable smell of that oil, arising from phocenic acid.

"Such is a very general and brief account of the principles of soap-making, which are few and simple. The great experience of the makers of a substance so long known had taught them empirically how to produce good soap in a great variety of forms; but it is only of late that the rationale of their processes has been understood, and that improvements have been made on scientific principles. Soap-making may now be considered as one of the arts most thoroughly understood.

"It is impossible here to describe the varieties of soap. Of the simple soaps, stearate of soda may be considered the type of hard soaps. It is hardly altered by contact with ten parts of water. Stearate of potash, with ten parts of water, forms a viscid solution. The margarates of soda and potash resemble the stearates. Oleate of soda dissolves in ten parts, oleate of potash in four parts of water. Hence, soaps are harder and less soluble, the more stearate and margarate they contain; and softer and more soluble when oleates predominate.

"As the soaps of lime, baryta, earths, and metallic oxides in general are insoluble, the use of hard water, which contains salts of lime, causes a precipitation of the insoluble soap, which is very prejudicial. This may be corrected by adding to the water as much carbonate of soda or potash as is sufficient to separate all the lime, before the water is used to dissolve soap. It is in this way that soda renders hard water soft, for washing and other purposes.

"The soap used in medicine is a hard soap, made by boiling to dryness in a gentle heat, one part of soda ley, sp. gr. 1·83, and two parts of olive or almond oil. It is a mixture of margarate and oleate of soda, with free soda and glycerine. *Antimoniated soap* is made by dissolving one part of precipitated sulphuret of antimony in caustic potash, mixing the solution with six parts of medicinal soap, and evaporating to dryness."

The preceding is one of the most simple, clear, and intelligible descriptions of the process of soap-making which we recollect ever to have seen, and gives as much practical detail as is required for the complete knowledge of the operation. Our long connection with this branch of practical chemistry, enables us amply to attest its value.

From the following, it will be evident that in the formation of plasters, the same changes take place in the oils as when formed into soaps: as their process is very tedious and unscientific, we advised the decomposition of olive-oil soap by means of one of the salts of lead.*

"PLASTERS.

"There are two kinds of officinal plaster made with lead:—litharge plaster, and white lead plaster; but all the compounds of oxide of lead with the oily acids possess the properties of plaster.

"*Litharge plaster*, or Diachylon plaster, is made by boiling five parts of levigated litharge (protoxide of lead) with nine of olive oil, and some water, till the whole acquires a proper consistence and a greyish white color. At common temperatures it is plastic; when heated it melts. It may also be obtained by adding subacetate of lead to a solution of soap. The plaster thus formed is good at first, but afterwards becomes hard; while that prepared directly from the oil remains plastic, apparently from the presence of undecomposed oil. Litharge plaster consists chiefly of a basic oleate and margarate of lead. It is the basis of almost all medical plasters.

"*White lead* plaster (Emplastrum cerussæ) is made in the same way, using sixteen parts of carbonate of lead to nine of olive oil. It is white, plastic in the heat of the hand, liquid at 212°. It enters into the composition of many plasters used in medicine.

"*Iron plaster* and *Mercurial plaster* are made by adding salts of mercury and iron to a solution of soap. They are insoluble masses, softened by heat, and are not much used."

We conclude our remarks for the present, expressing our firm conviction, that this supplement will prove highly valuable, by inducing attention to this part of chemistry, and that it will be the means of leading to still further

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employing alkalis of a given strength, an excellent soap is produced, having, when hot, the appearance of glue: on cooling it becomes a fine hard soap. He also finds that the addition of a large quantity of salt does not produce any separation.—Eds.

* See *The Chemist*, No. XV. page 91. March 1841.

discoveries. It will be read by all lovers of the science as a most valuable portion of an elementary work on chemistry which has no rival at the present day. In our next, we shall notice this work at greater length, and in a more complete manner; want of time and space this month not enabling us to do it the justice which it merits at our hands.

An Easy Introduction to Chemistry. By George Sparkes, late Madras Civil Service. London: Whitaker and Co., Ave Maria Lane.

This work constitutes an addition to the numerous attempts at removing some of the greater difficulties which beset the path of the incipient chemist, and it is by no means the least deserving of them. The instructions which it contains are given in language remarkable for its explicitness and for its freedom from the technicalities which serve so much to confuse the mind of the uninitiated.

The quantity of scientific matter contained in this little work does great credit to the author, who, in sending it forth to the world, has conferred on beginners in chemistry a benefit which, we have no doubt, will be duly appreciated. Such a work was much wanted.

PROCEEDINGS OF THE LONDON ELECTRICAL SOCIETY. — Session, 1841–2. Edited by The Secretary. London: Simpkin, Marshall, and Co., Stationers' Hall Court. Part II.

This part maintains the character which the first part acquired. Among the most important of its contents, we may mention Mr. Pine's second paper on the "Connection between Electricity and Vegetation." Mr. Pollock's second paper on the "Nature of the change of color of bodies by heat, &c.;" "The monthly register of the Electrical, &c., state of the atmosphere, for the months of June, July, and August, 1841," by Mr. W. H. Weekes; "Voltaic process for etching Daguerréotype plates," by Professor Grove. There are also some excellent papers by the secretary, Mr. C. V. Walker. Such of our readers as take pleasure in the study of the delightful science of electricity and its phenomena, will do well to read these "Proceedings."

LECTURES ON CHEMISTRY; *including its applications in the Arts.* By Henry M. Noad, Lecturer on Chemistry, Author of Lectures on Electricity, &c. London: R. Hastings, Carey Street; Scott, Webster, and Geary, Charter-House Square. No. IV.

The present number of this excellent work, which fully deserves the high opinion we have expressed concerning it, is devoted to the subject of "Chemical Affinity," and the theory of definite proportions.

Being unable this month to give an extract, which we hope to do another time, we will conclude by repeating our recommendation of it.

ELECTROTYPE MANIPULATION.— Part II.: *containing The Theory and Plain Instructions in the Arts of Electro-Plating, Electro-Gilding, and Electro-Etching, with an account of the several applications of Electrotype in the Arts.* By Charles V. Walker, Hon. Sec. Lond. Elect. Soc. Illustrated by wood-cuts. London: George Knight and Sons, Foster Lane, Cheapside.

This part contains much matter of practical and scientific value, and is a most excellent sequel to Part I. The author gives plain and easy directions for performing the various operations mentioned in the title.

To those who are desirous of obtaining a thorough knowledge of the subjects treated of in this little work, with as little cost as possible, it will be hailed as a boon; its cheapness bringing it within the reach of every class of readers.

Our remarks on Part I. apply with equal, if not greater force to Part II., and we recommend both to the perusal of such of our readers as may be desirous of becoming conversant with the beautiful art of Electrotype, and with the several arts which are intimately connected with it.

We regret that space does not admit of our giving an extract.

II. CHEMICAL MANUFACTURES.

PREPARATION OF A NEW BROWN PIGMENT.

BY T. W. NAYLOR.

In consequence of the high price of good water colors, artists employed in that style of painting have universally acknowledged the introduction of cheap and useful substitutes as a great desideratum. The pigment I am about to describe is intended to be used instead of some of the expensive brown colors, such as *sepia* for instance, which is generally sold in little cakes at 1s. 6d. each.

The new paint is prepared from the wood of the rosewood tree (*aspalathus*,?). The coloring substance is deep brown, not acted upon by water, but readily soluble in pyroxylic spirit, alcohol, and alkaline solutions, which latter are used as the solvents in the present instance.

The mode of procedure is as follows:—

The rosewood, in small pieces, is put into an earthen pan, and a moderately strong solution of either potassa or soda added thereto, when they are boiled together for about ten minutes, at the expiration of which time the greater part of the coloring matter will be extracted; but, should there still appear a good deal more in the wood, the boiling must be repeated with the addition of a little more of the solution of alkali. The whole must now be poured on the filter, and the clear liquid evaporated to a proper consistence, a portion of gum and isinglass is added, and the color formed into cakes, if thought necessary. Thus prepared, it cannot be used along with either Prussian blue, the lakes, or gamboge, on account of the alkali it contains, which would quickly change the color of those bodies; indeed, the Prussian blue would be totally destroyed, with the formation of a ferrocyanate of potassa or soda; nevertheless, no perceptible alteration was observed in the colors of vermillion, cobalt blue, chrome yellow, India red, indigo, yellow ochre, dragon's blood, umber, Venetian red, and terra-sienna.

Thus you may have an excellent brown water color, at the expense of a few halfpence, equal in quality to any of the prepared cakes sold by the colormen. To those individuals whose business is the coloring of prints, maps, &c., I think it must be of great service, both on account of its simple and easy mode of preparation and the cheapness of the materials.

From the circumstance of the resinous coloring matter being soluble in spirits, it may be advantageously used for communicating a deep brown tint to varnishes, &c., for lacquering, japanning, staining wood, and polishing. Its alcoholic solution, mixed with a little gum lac, forms a fine transparent brown varnish, free from any kind of glare or gaudiness, rendering it thereby a most admirable mixture for coloring such musical instruments as the violin, violoncello, &c., giving them, likewise, that appearance of great age at present so much admired; I have used its solution in carbonate of soda, for the same purpose, with great success, but the application of a coat of strong varnish will be requisite, in order to protect it from the effects of wet or dampness, which would otherwise dissolve the color and spoil the appearance of the instruments.

I am not aware the beforementioned wood has ever been employed in the arts of dyeing and calico-printing, but, from an experiment or two which I made, there is no reason to doubt but it will form a very useful dye for such articles as require brown colors of a great variety of shades; the alkaline solution may be decomposed by a weak acid, the coloring substance attaching itself to the fabric, which will produce a depth of tint proportionate to the strength of the bath, and the time in which the goods have been immersed.

That variety of the wood ought to be chosen which shows the darkest streaks, for any of the purposes before alluded to; but the dust from the logs as they are sawed into veneers can be had in abundance, and is, from its fine state of division, perfectly adapted for the extraction of the coloring matter.

MODE OF PREVENTING THE PRINT ON PLATES, BOOKS, &c., FROM TURNING BROWN BY AGE.

BY T. W. NAYLOR.

Every body will have observed the disagreeable brown appearance, resembling a halo, surrounding every line, letter, &c., of old printed works: it arises from the nature of the printing ink, the oleaginous portion of which soon leaves the black matter and is absorbed by the paper, leaving a stain of the above description fixed thereon. Although it is not my intention to say any thing as to the recovery of such books or plates to their original state, yet I think something can be done to preserve new works of value. The method I have adopted is to steep the articles in a strong solution of alum mixed with a little isinglass; this mixture is intended to fill up the pores of the paper, and thereby take away its absorptive nature. I have prepared some prints in this manner, which do not appear to have changed color in the least, but, what may take place after the lapse of years it is not in my power to say.

To the Editors of The Chemist.

Ryde, Oct. 1, 1841.

Gentlemen:—

I find, on reading my letter which is inserted in No. XXII, of the Chemist, that a mistake has been made in the quantity of one of the ingredients mentioned therein; I mean the *spermaceti*. Those quantities would make a very different composition and one which would not succeed; I shall therefore feel obliged by your correcting it in a future number.

I cannot imagine how the error could have occurred, unless it was a mistake of the printer. I am, Gentlemen,

Yours respectfully,

John Horsley.

Mutton Suet	1¾ oz
White or Virgin Wax ..	1¾ oz.
Spermaceti	½ *a pound.*

[The error lies at the door of our esteemed correspondent himself.]

III. PHARMACY, &c.

ON A NEW SYSTEM OF MEDICAL EDUCATION, GOVERNMENT, AND PRACTICE.

BY CHARLES WATT.

Οὕτω γὰρ ἂν μάλιστα καὶ δυνήσομαι εἰπεῖν, καὶ ὑμεῖς μαθήσεσθε.

ESCHINES.

HAVING in our last number, given ample details of the bad effects resulting to the pupil and to the public, from the present defective and degraded state of scientific education, especially that portion which relates to medical science, we may observe that any attempts at reform in the government, will be utterly useless, unless they be founded on an improved mode of study, and on a more effectual and extended, but less capricious and cruel mode of examination; and therefore in continuation of the subject we now proceed to lay before our readers, A NEW AND IMPROVED METHOD, which must destroy the deference paid to a bad, though established, custom, — which must, at one swoop, remove the numerous and lamentable sources of ignorance and immorality, with which the one now in use abounds,—and establish in its stead, one which places in the hands of the student, the easiest and most certain method of gaining a knowledge of his profession, while it gives to the public perfect protection against the dangers of ignorance and the presumption of pretenders;—a method which, from the necessity of making due and daily progress, it enforces on the pupils, and the evidence it affords of their advancement or of their neglect to the professors, must, at length, prevail, despite of every obstacle that conflicting interest and grasping cupidity can oppose,—one which, by the well-arranged distribution and constant employment of the time of the student, secures him against the allurements of bad company and habits of idleness, enables him to gain his diploma with ease and honor, and finally hands him over to society without disgrace to the one, or peril to the other. Such a plan, we are convinced, will be readily admitted by all who peruse this section of our subject to be a valuable substitute for the buffoonery of lecturing and bully, to justify us in prefixing the above motto from Eschines—"For thus shall I be able to teach and you will learn most effectually."

Sure are we, that there is no one who has passed the ordeal of examination at either Board, viz. Apothecaries' Hall or College of Surgeons, who would not have rejoiced at the opportunity of such a method of study; and no one who is about to do so, who would not hail as a boon, a system of instruction which renders secure his admission without that dread of rejection and consequent disgrace, which, in those who have suffered them, as we have frequently observed, never, in after life, are totally removed, and of which the memory is often revived by rivals who, having the power, are always ready to do the foul work of disparagement to one of their own profession.

In the course of this general view of the new system, it is our wish first to point out the vast contrast between the two methods, that—while none will deny that under the existing one, very limited and deficient knowledge is quite enough to gain a certificate,—under the one which we propose, it is utterly impossible that any deficiency of knowledge should not be made evident; nay more (and this is its most valuable feature), the latter entirely prevents the possibility of rejection at public examinations; for, as the professors would thus be made acquainted from week to week, and from day to day, with the exact knowledge and advancement of every pupil, no one could present himself to the Board, before he had completed the course of study prescribed at the school we seek to establish, or without having arrived at a perfect knowledge of each subject, because he could not be admitted from one class to another, until he had been examined, and his fitness fully proved—in short, until he had learned the whole business of that class. It will therefore, be at once seen, that though he may learn even by the present imperfect system,—by that now proposed, he *must* learn, or his neglect and ignorance be at once detected, and suitable admonition or other measures be resorted to, even though they should include his dismission from the Institution; for it is

utterly useless to institute any system, unless all parties are compelled to abide by the rules necessary to carry out its objects, and to perform the duties it requires.

The great end we have in view, is the public good. How our humble endeavours may attain it, by this attempt to establish a rational system of education, will be made manifest in the following columns.*

The first portion of the method consists in dividing each subject into CLASSES (taking, for example, Anatomy, as it is given in the sequel), and again to subdivide these classes as minutely as possible.

The next step is, to have a set of printed CHARTS or CARDS containing just as much matter as can well and easily be acquired each day; allowing, at the same time, for the other studies which belong to professional education; the amount of matter on each day's chart being regulated by the whole number required for the course of anatomy. This chart being learned by the time at which the class meets again, the pupils will be required individually to repeat to the examiner appointed, and to demonstrate all the parts and circumstances connected with each particular point, on the bone or recent subject, the dry or moist preparation, as the case may be. If the pupil thoroughly know it, he delivers up his chart, and receives another; if not, he keeps it another day; and if his deficiencies are but few, he may receive another, but never more than two.

The office of daily examination is to be deputed to the pupils in turn; so that each is made to demonstrate. Thus, while he is himself learning, he is made to assist others less advanced; and by this means is maintained a regular system of reciprocal teaching and learning.

At each daily course of instruction, however, the professor is to be present; and, on his daily inspection, he will have a perfect knowledge of the proficiency, or inattention, of every pupil committed to his care, and will thus be enabled to encourage the one, and correct the other.

The business of the daily examiner is to put the word "Absent," against the name of such pupils as do not attend; to see that none of the daily charts are undelivered; and to enter all that are not delivered at the daily attendance. The examiner is also to record in a book the progress of each pupil; and, if he have made more than two omissions, to state these, in order next day to see if they are then known to the pupil.

At the time of delivering the charts or cards the person entrusted with this office is, if the subject be anatomical, to demonstrate all that each card contains, on the natural parts. If it be a subject of chemistry, he is to illustrate the facts by experiments, and to explain all relating to them. In the medical and surgical departments, it will be the duty of the teacher, on each succeeding day, to deliver to the pupils of each class, the history and treatment of the accidents which befall those parts, and the diseases which affect those functions, the knowledge of which they have previously acquired. This is all the lecturing admissible into this system of teaching.

When the pupils of any class have acquired the knowledge which is its object (of the bones for instance), they enter another class (that whose object is the ligaments), and so pass on, until they complete the whole of the classes in the course of instruction; at which period they receive from the professor a certificate of attention and proficiency, in order to entitle them to appear before the public examiner, whose duty it is to act between the candidate and the public, as the judge of the one, and the conservator of the interests of the other.

On the Saturday of each week, it will be the duty of the demonstrator of the day, assisted by others (for, as already said, one will be appointed for each day), to make recapitulatory examinations of the pupils, as to their knowledge of the week's business, to render up to the professors an account of each pupil's progress, as recorded in the book which is kept for such purpose, and which contains an account of the mistakes made by each pupil, in his examinations. If they exceed more than two or three in each day, or by their frequent recurrence evince a want of due attention and perseverance, the pupil must either employ additional time to keep pace with the class, or he must suffer degradation.

To such a method of teaching, no one will

* Although some portion of this plan was given in a former number, we consider it best to repeat it here, in order that our readers may have the whole system before them in a connected form.

hesitate to submit, but those who, under the present one, would avail themselves to the utmost, of the opportunity it affords for inattention and idleness. It is, therefore, for these especially that such a check is requisite. By the assiduous and steady pupil, it will be hailed as a boon; while the careless one, on the contrary, will be made to feel that he cannot trifle or neglect with impunity, or without detection and remonstrance.

In order to effect rapid and sure progress in the prosecution of all studies, nothing is so essential as simple and natural arrangement. In medical studies, this is especially requisite, in consequence of the great diversity of subjects which they necessarily embrace. In no kind of study, however, has simple and natural arrangement been so little adopted.

Botany, which considers the external form and internal structure of plants, is often preposterously studied after materia medica, which explains their applications; the practice of medicine is often, with equal absurdity, studied before the theory upon which it ought to be founded; and, with not less absurdity, whatever portions of the practice of medicine have in them any thing of mechanical operation, are arbitrarily and most unnaturally patched together under the name of surgery, although they cannot possibly be either separately studied or separately practised.

Even in the general plan of study, there are numerous other mistakes every day committed, not less important than these. To enter into their particular enumeration, would not be an agreeable task, and may be advantageously avoided by delivering a general method, which is at once simple, natural and impressive.

GENERAL ARRANGEMENTS OF STUDIES:*

I. Mineralogy and chemistry; botany, vegetable anatomy and vegetable physiology; and zoology, anatomy and physiology, which refer entirely to health, if all introduced into a course of medical study, ought to be studied before any of the sciences which refer to disease, and which I shall subsequently mention. They ought also to be studied precisely in the order in which they are here enumerated.

1. Mineralogy, if studied, ought to be studied first, because minerals are more simple in their structure than either vegetables or animals, and also because they afford the materials of which these are composed. It ought even to be studied before chemistry, because it affords the fundamental subjects of chemical operation.

2. Chemistry ought to be studied immediately after mineralogy, because it considers the actions of the substances of which mineralogy merely describes the structure; and, as it is thus so far dependent on mineralogy for its subjects, it necessarily, along with it, precedes botany.

3. Botany, if studied, ought to be studied immediately after mineralogy and chemistry, because it considers the bodies which are next in simplicity, and because the vegetable objects which it describes owe their elements to mineral substances. It ought to be studied before the sciences which refer to animals, because they consider objects which are more complex than its subjects, and also because the subjects of botany afford many of the elements which enter into the formation of the animals which these sciences consider. It ought also to be studied before vegetable anatomy, because the external form of plants should be understood before their internal structure.

4. Vegetable Anatomy ought to be studied immediately after botany, because the internal structure ought to be studied immediately after the external form of plants is understood. It ought to be studied before vegetable physiology, because the actions of the parts of plants cannot be understood before their structure is explained.

5. Vegetable Physiology ought to be studied immediately after vegetable anatomy, because it considers the actions which the previously understood structure performs; and, as it is thus immediately dependent on vegetable anatomy, it necessarily, along with it, precedes animal anatomy.

6. Zoology ought to be studied after botany, vegetable anatomy and vegetable physiology, because it considers the bodies which are next in simplicity, and because the animal objects which it describes owe their elements, directly or indirectly, to vegetable substances. It

* The Latin and Greek classics, ought, as a portion of elementary education, to precede all medical studies. But to ensure knowledge of this kind to the student of medicine, proper persons should be employed to aid pupils, if deficient—especially in medical Latin.

ought to be studied before anatomy, because the external form of animals, which it considers, should be understood in a general way before their internal structure.

7. Anatomy ought to be studied immediately after zoology, because the internal structure ought to be studied immediately after the external form of animals is understood. It ought to be studied before physiology, because the actions of the parts of animals cannot be understood before their structure is explained. Comparative Anatomy presents to us nature's innocent experiments, in which no torture is inflicted, no function is deranged, and no blundering conclusion can well be drawn.

In Anatomy, the muscles are sometimes described before the ligaments, although it is impossible to understand the actions which the muscles actually perform without previously knowing the motions which the attachments of the ligaments permit. The arteries are often described before many of the viscera, although it is impossible to understand their course without previously knowing the structure of these viscera. The arteries are always described before the absorbents, although, did the absorbents not precede them both in existence and in action, the arteries would be destitute of blood. But I need enumerate no more errors of this kind: they are within the reach of every one's daily observation.

In anatomy especially, a better method of teaching is of the highest consequence, as it is indispensable to a knowledge not only of surgery, but of medicine; and this will be successful only by the employment of such a system of teaching, that its facts, if studied, must be acquired, and the teacher daily apprised of the exact progress made, or of any inattention or neglect of the student. That this noblest of all the sciences claims especial attention is evident, as, independently of its value to the physician or surgeon, bringing him into full acquaintance with the means by which "we live, and move, and have our being," and enabling him to understand with accuracy, to relieve with surety the afflictions of his fellow-man, and to obtain for himself well-merited reputation and reward; it is in every respect, of all knowledge the most essential and important. "The proper study of mankind is man."

No order, however, of studying anatomy and physiology is advantageous either to the teacher or the pupil, except the natural one. That is, the organs and functions termed locomotive ought to be described first; next, those named vital; and, lastly, those denominated mental. Under the locomotive, ought first to be explained the bones or organs of support; secondly, the ligaments or organs of connexion; and, thirdly, the muscles or organs of motion: under the vital, ought first to be explained the absorbing surfaces and absorbents or organs of absorption; secondly the heart, lungs and blood-vessels or organs of circulation: and, thirdly, the glands and secreting surfaces or organs of secretion: under the mental, ought first to be explained the ear, eye, &c., or organs of sense; secondly, the brain or organ of perception, &c.; and, thirdly, the cerebellum or organ of volition.

Although this general arrangement, proposed nearly forty years ago, has never been generally adopted, yet every deviation from it is no less a deviation from the natural and the most advantageous method of study.

8. Physiology ought to be studied immediately after anatomy, because it considers the actions which the previously understood structure performs; and, as having a reference only to health, it necessarily immediately precedes the following series of sciences, which refers to disease.

II. Pathology or the theory of diseases, morbid anatomy, materia medica and pharmacy, the practice of medicine, surgery and midwifery, which refer entirely to disease, ought to be studied after the sciences which refer to health. They ought also to be studied precisely in the order in which they are here enumerated.

1. Pathology, of all these, ought to be studied first, because it affords the basis of all subsequent procedure. It ought also to precede morbid anatomy, because it explains those actions which terminate in the states described in morbid anatomy. Pathology may, therefore, be thus considered as regarding causes, and morbid anatomy as regarding effects; though these effects become causes in their turn.

2. Morbid Anatomy ought to be studied immediately after pathology, because it describes the various states which are induced by the actions considered in pathology, and which in their turn induce new actions. It ought also to be studied immediately before materia medica, &c., which refer to the removal of these states, because the states must

be understood before their removal can be rationally thought of.

3. Materia Medica and Pharmacy ought to be studied immediately after morbid anatomy, because they afford the means of removing these states. They ought to be studied before the practice of medicine, because no practice can be adopted without previous possession of these means.

4. The Practice of Medicine and the Operations of Surgery ought to be studied immediately after materia medica and pharmacy, because their use ought immediately to follow the possession of the means.

5, and 6. Surgery and Midwifery may be regarded as branches of Medical Practice.

With regard to THE TIME WHICH THESE STUDIES OUGHT TO OCCUPY, three or four years may suffice.

In the winter of the first year, ought to be studied mineralogy and chemistry: in its summer, botany, vegetable anatomy, and vegetable physiology.

In the winter of the second year, these sciences ought to be reviewed; and zoology, anatomy, and physiology ought to be studied. The review of the preceding year's studies will occupy little time; zoology, generally considered, will not occupy much; anatomy and physiology will be entitled to the greatest share of it; and actual dissection will be so in an especial manner. Nor is this period, if both lecturer and pupil do their duty, by any means too short for considerable advance in these sciences. The summer of the second year ought to be occupied with the continued review of the preceding sciences, especially with the last—anatomy, comparative anatomy and physiology, with dissections; and pathology and morbid anatomy ought now to be studied.

In the winter of the third year, the preceding sciences ought still to be reviewed, especially anatomy, comparative anatomy and physiology, with dissections, and also pathology and morbid anatomy; and materia medica and pharmacy, and the practice of medicine, ought now to be studied. The summer of the third year ought to be similarly employed. And, during the summer (if not the winter) of this year, an hospital ought to be attended.

Those, who can employ four, instead of three years, ought to employ the last in a continued revision of preceding studies, and especially in attendance at an hospital; so that the period of actual practice may be enlarged. To attend an hospital, however, before the study of the practice of medicine and surgery has been begun—that is, in the third of a three years' course of study, such as I have described, is utterly useless, except to those who may have previously studied at another school or university.

Under the system, then, of daily, gradual, and progressive instruction here described, the pupil would with facility gain ample, well-arranged and satisfactory knowledge, would soon become satisfied with the advancement he had from time to time made, and would give assurance to those entrusted with the direction of his scientific education, of the proper employment of his time in the various departments of his profession.—Under this test of daily examination, the professor may become acquainted with the moral occupation and progressive advancement of his pupils, and thereby be able, not only to check such improprieties of habit as may otherwise become fixed and established, but to cultivate and confirm in them the conduct and habits of gentlemen.

Instead of the barbarous system of apprenticeship, the youth who selects medicine as his profession should at once commence his studies according to the method here stated, which, instead of wasting five years, may, in four years, complete for him a regular and profound course of education in every branch of science relating to medicine and surgery; following in succession the plan given for each subject, in strict observance of the previous "lucidus ordo."

With regard to HOSPITAL ATTENDANCE, I may here observe, that the surgeon requires surveillance, as well as the pupil. It is much to be desired that a strict eye were kept upon the way in which patients are treated, particularly on days of admission at hospitals and dispensaries, and that all cases were reported wherein patients are made to wait some three or four hours until the medical officer arrives, though their diseases are often such as to be encreased by exposure to cold, &c.

As to EXAMINERS, they ought to be chosen from among medical men retired from practice, and unfettered by its urgent duties and inevitable anxieties; they ought to be perfectly independent of all occupation disqualifying them for this office; and their time ought to be devoted solely to testing the knowledge and qualifications—the fitness or incapacity of the

candidate to undertake the duties of his profession. They would thus be placed above the suspicion of partiality. When indeed the importance of these sciences, and their practical application to the vast and sad catalogue of human afflictions, are duly estimated, it will be evident, that the best system of teaching them, and that of giving ample and perfect satisfaction to a duly qualified Board of Examiners, is at once a protection to the honor and character of the healing art, and a duty to mankind.

To remedy the errors of the examinations, I have formed a plan founded on the system I am here inculcating—a plan which at once rids science of those useless automatons, the examiners, and them of their irksome task, as well as of the odious position of being often the objects of suspicion, either of partiality or of the indulgence of ill-temper. I have before said, that not mere *presumption* of qualification is sufficient, but that absolute proof is demanded, and that the examinations must be such, in point of quality and minuteness, as to satisfy the public that the knowledge of the candidate is perfect and complete. Instead, therefore of a few extemporaneous questions being deemed sufficient, a systematic table of examinations ought to be kept, and one also of the answers to be given with which are to be compared those returned in writing by the person under examination. It is quite clear, that if on such a plan as this the pupil were rejected he could have no one to blame but himself, nor to feel that any one else has had any share in his degradation. By this method the obnoxious practice of Final Public Examinations would be for ever abolished, which are as useless and idle as they are cruel and destructive of the future happiness, prosperity, and dignity of those who have had the dire misfortune, under this mistaken and worthless system, to be sent back to renew their studies, and who will ever feel that, although they may ultimately be admitted, the stigma is never entirely removed. In the stead of these mere farces—displays of mummery—ought to to be adopted, weekly or monthly examinations, consisting of a full systematic and written table on each particular subject, comprising a minute detail of the facts and doctrines of the science. To these, written replies to each question are to be made by the candidate, due care being taken that he possesses about him no document whence to borrow the required knowledge; and such a mode of frustrating the object can effectually be prevented, by the presence, during his probation, of a proper person employed for the purpose in each department of science, the knowledge of which is required to be attained by the pupil. A plan, like that I have here developed, would for ever exterminate the mass of evil fostered by the present method, and in a pre-eminent degree advance the honor, dignity, and independence of the profession, and give to the public perfect and lasting satisfaction and security.

It may be urged, we must admit, that these tables of questions and answers will get into the hands of students, who may thus prepare themselves for the occasion.—Well, so much the better: they will be profoundly versed in Medicine and Surgery!

I am fully aware that this attempt to put down a worthless system, and erect in its stead one founded on reason, will draw upon me the odium and obloquy of the adherents to that which is recommended only by its suitableness to their purposes and advantages; these, however, to me are matters of the most ineffable unconcern. Having utter abhorrence and contempt for the quackeries, juggling, and ignorance with which medicine at present abounds, and for the foppery, and cupidity, and monopoly which lecturing so aptly assists, and being placed totally out of the reach of selfish, conflicting, and malignant interests, I cannot be injured by the opinions of such parties in the remotest degree. I remain in perfect confidence and security as to the success of the method I propose, and in full certainty of its benefits to science and mankind, to whom alone I look for approbation.

(*To be continued.*)

ADULTERATION OF TOBACCO.

BY CHARLES WATT, JUN.

It has now become a practice among dealers in the various commodities of life, to adulterate the goods in which they trade to the greatest extent in their power; but should the article be one which will not admit of adulteration, they turn their attention to the discovery of some method by which the article is rendered more easily destructible. The adulteration of which I am about to treat is one more especially of this description, though it is operated on to some extent in both ways.

Formerly, cabbage and lettuce leaves dried, chopped, and steeped in a decoction of tobacco, were the adulterating substances most in vogue with this class of persons; but the public have become aware of this fraud, and therefore it cannot any longer be practised with advantage. I do not mean to say that it is quite out of use; but tobacco, so adulterated, burns with an unpleasant odour, and is so reduced in strength that the consumer detects the fraud: moreover, it burns with a black ash instead of a white one as is the case with pure tobacco; and as this is the criterion by which all practised smokers judge, the dealer has been obliged to adopt some other mode of increasing his profits, and which is in most cases the following:—

A saturated solution of nitrate of potassa is made, and the tobacco is moistened with it. By some parties the tobacco is partially dried after this operation, but by far the greater number send it out without even doing this. This adulteration operates beneficially to the dealer in two ways: in the first place, it causes the tobacco to consume faster, by supplying oxygen; and in the second place, it enables him to add more water than he could otherwise do.

This adulteration may be detected by drying a piece of the suspected tobacco, placing it on a plate and setting it alight: if it contains nitrate of potassa; it will burn more brilliantly in some parts, than in others, and it will likewise sparkle as it burns.

Tobacco naturally contains a small portion of this salt, but the quantity is too minute to be detected by the above means.

It has long been a matter of dispute among medical men, whether the fumes of tobacco are injurious or not; but they do not seem to have come to any decision on the subject; however, it has never for a moment been doubted, that the fumes of binoxide of nitrogen, which are given off during the combustion of nitrate of potassa in contact with carbonaceous water, in the combustion of the tobacco in question, must be highly injurious; for directly the binoxide of nitrogen is brought in contact with the air in the mouth, lungs, &c., it is converted into nitrous acid, than which there cannot be a more injurious compound; and though it may be argued that the quantity is but small, yet it is to be considered that the quantity, however minute, is being constantly applied.

I therefore consider this adulteration one of a most cruel nature: not only does it defraud, as these adulterations generally do, the laboring classes in particular, but it injures their health: some stop ought to be put to the perpetration of such villany, and the punishment merited by the perpetrators insured to them.

It is really somewhat surprising that in the 19th century, such abuses should be allowed to exist; but it is no less true than lamentable, that scarcely an article can be named which is not by some means or other adulterated. And I believe this article, which may almost be considered one of the necessaries of life to those who indulge in the habit of smoking, comes in for its full share.

Besides the adulteration of which I have spoken, tobacco is subject to many others, such as chloride of sodium, and, in some instances the nitrate of soda is substituted for the nitrate of potassa, to lay which before the public. I am now engaged in some experiments on this article, in the hope that I may be in some measure instrumental in awakening attention to the treatment which they receive at the hands of the dealers in the various articles of commerce. Should I succeed in my endeavour, it will be to me the greatest recompence I can receive for any trouble I may take on this or any similar subject I may lay before the readers of "The Chemist;"—in fact exposing imposture is at present the only method which can be adopted to check it; and when these manufacturers find that their trade is falling off, they may at the same time be compelled to acknowledge the truth of the maxim, that "honesty is the best policy."

INUTILITY OF THE PHARMACEUTICAL SOCIETY TO COUNTRY DRUGGISTS.

Edinburgh, 16th Oct. 1841.

Gentlemen,—

In the last number of your journal, there were a few remarks, entitled "Inutility of the Pharmaceutical Society to Country Druggists," upon which I would crave the liberty of offering some observations, more particularly as I think your correspondent has distorted the exertions of the Society, and has taken some prejudicial notions regarding it.

There are some passages in your correspondent's letter which are not a little sarcastic, and calculated to bear against the infant society in the eyes of all country and provincial druggists. Were these insinuations just, we could not blame the "Country Druggist" for shewing forth to his brethren the fallacies of this institution,—nay, we should be ready rather to commend him for his exertions in the cause of truth. At the very outset of his epistle we are told, that he rejoices at the rise of the Pharmaceutical Society, but then he immediately laments, "that its progress is *not* more *marked* and *distinct*." Now the whole tenor of his letter appears to be, the attempt to prove that the present rate of subscription is too great, and that its objects are too *extended*. This is somewhat contradictory, if we compare the two statements. If your

correspondent will but retrospect the actions of the Society since its very recent establishment, he cannot fail to be pleased, unless indeed he supposes, that the council should be possessed of the far-famed cap of Fortunatus, the placing of which upon the cranium of the chairman, with the request by the other members, that he would express such and such laws, would be instantly followed by the execution of the so inwardly formed idea. I cannot think what are his objections to the name of the Society, for, as Juliet has it, "what's in a name?" Besides, had the parties forming the Society sought the English language throughout, they could not have found a *plainer* or more *appropriate* title than the one given to it. Your correspondent says, within a parenthesis, "great name this." Is it not, strictly speaking, a *Pharmaceutical Association*, and is it not intended in its ramifications to extend over *Great Britain?* Where then is the vanity of calling this association by its proper name? As well call the department of medicine a misnomer, which includes the compounding of drugs, and which has been entitled Pharmacy. We well know that it has been the attempt of chemists and druggists on both sides of the Tweed, to unite themselves into a body, and improve themselves, well knowing their comparative illiterate condition, and observing daily the encroachments made upon their rights and privileges. But we are also aware that their endeavours have been abortive, their most powerful efforts have turned out a rope of sand. And when we have a prospect of something based upon a substantial foundation, ere the lowest stone in the building has been well laid, we have the puny efforts of an individual to overthrow the whole structure.

Great weight is laid upon the remark, that the London Druggists are better educated in scientific matters than country or provincial druggists. The truth of this I deny in toto, for I hold an opinion diametrically opposed to this, and one founded on observation. Whatever chemists in London *may hereafter* be, *at present, generally* speaking, they are less conversant with Pharmaceutic Chemistry, than provincial young men. This is at first sight quite paradoxical, particularly when we recollect the great and frequent opportunities afforded by numerous talented gentlemen, lecturers on science. But then, on the other hand, let us bear in mind that London is perhaps the greatest commercial city in the world, and that young men engaged in business have no time to spare either to study, attend lectures, or experiment. Nay, for many months in the year it is with difficulty half an hour can be snatched for meals. Perhaps this is unknown to the "Country Druggist," who hits so severely at the Pharmaceutical Society, but I can assure him that I have practically experienced what I have asserted.

It is allowed that the Society has done one good act in successfully opposing the obnoxious bill of Mr. Hawes. Having gained one victory, it was the very circumstance which ought and has stimulated us to renewed exertion, and our concentration and stability now depend upon the united co-operation of all chemists in England and Scotland. Before we condemn this institution, let us see how it will work: a very few years will give us some notion of its merits; while our 2*l.* 2*s.* will be well spent, were it for no other purpose than that of assisting to pay the expenses incurred by the late Parliamentary opposition. That has gone, but we do not know what may yet come; let us, therefore, be on our guard. There is an old Scotch saying, "Fules and bairns should na' see half-done wark;" let us profit by this, and not endeavour to strangle the infant at its very birth. I am probably at a greater distance from London than your correspondent, and perhaps can as little afford to contribute my mite to the institution; yet, I cannot close my eyes to the good likely to accrue, after the Society shall have been in operation for a little time.

The Society is much blamed for not being "chartered or recognized by the Legislature;" but here your correspondent puts the cart before the horse, because no legislative assembly would grant protection to a body of men, until they had given proof of being capable of managing themselves as a corporate body. Parliament is not a physician, who, upon being applied to, will at once, and without reflection, grant a recipe. Proof, and strong proof, must be yielded, of fitness, to be worthy the countenance of the Legislature of this country, ere we can be chartered. Let, therefore, the prospect of this rather stimulate us to renewed exertion, than damp our ardour.

The power of writing M.P.S.G.B. at the end of the name of members, is looked upon with much contempt by your correspondent. It is true that EXISTING druggists can at the present time obtain this privilege upon payment of a fee; but after a certain date, those who enter the business will be required to pass an examination, and obtain the Society's diploma ere they can commence. But supposing it otherwise, how many societies are there into which you can be admitted by paying a sum of money? The Society of Arts (F. S. A.), the Botanical Society (M.B.S.), and the Geological Society (F. G. S.), are instances of this.

We do not as yet know how many good branches may be given off from the parent stem, but as a root must somewhere exist, why not let it be in London, from whence we may imbibe a share of instructive sap and nutriment? There is a field there, and concentration of talent, amidst which this Society is more likely to flourish, than if carried into some of the Midland counties, where it

would be more likely to die a lingering death, than live in honour and prosperity.

Your correspondent's quotation is very apropos to this subject, and as all must admit its truth, although couched in strong terms, it forms one of the very best arguments we could use for the formation of the Pharmaceutical Society of Great Britain. I refer to the following, from Dr. G. O. Rees' work on the Analysis of Blood and Urine:—"The existence of such a body as the untaught tradesmen, who arrogate to themselves the title of Chemists, remains as one of the most amusing absurdities of the nineteenth century."

Let us hope that, by our united exertions, we may shake off this stigma, and let it henceforth recoil on those who shall use it; and, in conclusion, allow me to subscribe myself a friend to medical reform; and although so far north as to come under the denomination of a Scotch Druggist, I am yet not ashamed to add—

M. P. S. G. B.

ASSISTANTS' SUBSCRIPTION TO THE PHARMACEUTICAL SOCIETY.

Sir:—

The reformation which is now being planned among chemists and druggists is an event which they all should hail, and to which all should lend effective aid, in order to bring it to a successful termination; intended as it is to raise the character of the trade, to set it on a more secure basis, and to protect it against the encroachments of unqualified persons. Their being united together in one body will form such a concentration of talent as cannot fail to promote the advancement of pharmaceutical science, to place us in a position to dispute with the French the fame which they have so long enjoyed as the first pharmaceutists in the world, and to raise us in this science to a rank worthy of our attainments in the others.

The advancement of science and the diffusion of letters have removed from the public mind the superstitious ideas which it formerly associated with the compounding and practice of medicine: we now no longer invest it with an air of mystery, nor employ those cabalistic figures, which the old apothecaries used *ad captandum vulgus*, and, instead of

"A beggarly account of empty boxes"—

handsome and well-filled shops are met with in every town.

But still with all the tinsel and outward show which chemists' shops of the present day exhibit, it must be confessed that with many, a knowledge of pharmacy is at a very low ebb, and even the first principles of chemistry not understood. To remedy this evil is the primary object of the Society, and too much praise cannot be given to those who have executed the scheme of its foundation.

But in a pecuniary point of view a serious obstacle exists to its ultimate success, and which, if not obviated, will nullify all past exertions. Whilst I succumb with all due respect, to those who have brought the Society to its present state, and who have doubtless studied it in all its bearings, still it is my opinion that the amount which they demand as the annual subscription of assistants and apprentices, is much too great: half the sum would certainly suffice for all the purposes contemplated, and to enable it to carry on its operations on a scale becoming its title as "The Pharmaceutical Society of Great Britain."

The chemist's assistant, "*parvo laborum præmia ferens*," after having supplied his necessary and immediate wants, seldom possesses money to lavish in unnecessary expenditure, and the sum stipulated will be extremely burthensome to the majority, and irksome to all.

As this is also the general opinion, it is to be hoped that the committee will take the matter into consideration; for by lessening the subscription they will assuredly accelerate the completion of their design, and obtain the cordial co-operation of all parties.

I am, Gentlemen,
Respectfully yours, &c.,
Αλφα.

PATENT MEDICINE LICENSES.

To the Editors of The Chemist.

London, Oct. 1st, 1841.

Gentlemen,—

The season has returned for the payment of 2*l.* license for the sale of patent medicines, by those who have the very questionable advantage of trading within the limits of the two-penny post. Can any of your subscribers explain the equity of the tax, when the license at Liverpool, Manchester, and every great town in England, is only 10*s.* 6*d.*, and if without the limits of a borough town, only 5*s.*? It is to be further borne in mind, that tradesmen in the country deal in a more general stock; a greater variety of articles are usually sold by them, and they are every way capable to pay an equal tax with the outnumbered druggist of London. An union of the druggists of the metropolis for a fair adjustment of the patent medicine licenses, would be one of the most useful and legitimate which any class could form. The profits upon patent medicines do not exceed twenty per cent., and out of the sale of patent medicines 40*s.* are to be paid. There may be a tolerable number who may sell more than 40*l.* worth of *patent* medicines a-year; but the great bulk of the patent medicine vendors

of London, I sadly fear, do not accomplish it. Surely some effort should be made to call the attention of the commissioners of stamps to the severity of this tax upon London tradesmen. I am, Gentlemen, one of the old school, and

A Subscriber.

CHEMISTS AND DRUGGISTS AN UNRECOGNIZED BODY!

To the Editors of The Chemist.

Gentlemen:—

It would appear that chemists and druggists in general feel greatly flattered by the often reiterated taunt of their want of recognition, from the readiness with which all echo and adopt the assertion, who have either said or written any thing upon the subject of their present condition, tacitly admitting its validity.

I ask, what is meant by the assertion? Is it that they are not recognized as a scientific body,* or does their want of recognition consist in the practice of pharmacy not being classed amongst the professions? I answer, in the latter case the distinction is a mere bag of moonshine, and, for my own part, I am content to retain the substance, leaving to those who delight in titles, the possession of the shadow; or in other words, give me the tangible benefits herein enumerated, which constitute a recognition of the trade, in preference to the empty title of Professor.

I think the failure of the late attempt at interference with the privileges of chemists and druggists, should be admitted as proof that they are at least recognised by the legislature. The fact of a member of the trade holding an appointment as chemist and druggist in the medical department of Her Majesty's household, is sufficient evidence of their recognition by the crown. That they are recognised by the whole body of physicians and consulting surgeons, as the legitimate compounders of their prescriptions, cannot be denied, as it is their invariable practice, on the question being put, as to whom they are desirous of its preparation being confided, to recommend a chemist as the dispenser; and doubtless it is with difficulty they can dissemble their chagrin and disappointment on the apothecary in attendance, or as he is commonly called, "the family doctor," taking possession of the recipe, knowing full well that their endeavours to restore the patient will in all probability be frustrated either by the careless or surreptitious compounding of the same. That chemists and druggists are recognized by the "general practitioners," is equally apparent, from the jealousy with which they view the superior performance of the duties connected with the departments of pharmacy, by their calumniated rivals, a circumstance to which in great measure is to be attributed the hostility at present evinced towards them. The last class, though by no means the least in importance, by whom chemists and druggists are recognized, is the public. So much for their want of recognition.

Gentlemen, in the above observations, I have endeavoured to refute the statement with which this article is headed, according to my definition of the term; also to prove the accusation to be a gross libel on the public and the trade, which seems to have been imbibed as eagerly as it has been disseminated. I trust I have succeeded, and remain,

Yours very respectfully,

Pharmacopola.

* It is for them to prove their title to be distinguished as a scientific body in future.

ADVERTISING CHEMISTS.

To the Editors of the Chemist.

Gentlemen:—

I very much approve of the remarks made by your correspondent, *Pharmacopola*, in your last number.

Now that we have a Pharmaceutical Society, and a recognized organ, well known by its appropriate title—The Chemist—it is the fault of chemists and druggists themselves, if they do not by every means discountenance and denounce those mercenary scoundrels, who, to benefit themselves in one degree, do not hesitate to injure the general trade to an amount and proportion of perhaps 8 or 10 degrees.

I would not confer any additional honor in noticing the "respectable individual" alluded to in your correspondent's note, otherwise than by enquiring if the same party is not a manufacturer of "Indian Rubber" Court-Plaster? If this said manufacturer is the identical person who advertises his "first-rate" *articles* for "Families and *Invalids*"(!!!) do the chemists and druggists act consistently with their interests, or the principles of respectable trade, by countenancing either him or his manufacture?—Yours truly,

A Member of the Pharmaceutical Society.

P. S. I have my eye on sundry other gentlemen of the craft, who will do well to reform, or their actions shall be made as notorious as they are already unprincipled.

CORRECTIONS OF THE POCKET FORMULARY.

To the Editors of The Chemist.

Gentlemen:—

I shall be greatly obliged by your allowing

me, through the medium of your widely circulated periodical, to point out two or three errors which I have lately discovered in the *Pocket Formulary*—a little work which was favourably noticed in your January number. Few as they are (considering that the work contains more than six hundred formulæ), I think it right to afford the purchasers of the work an opportunity of correcting them; and as the greater part of the impression is already disposed of, it is too late to do so by inserting a list of errata in the book.

It is no agreeable task for an author to proclaim the imperfections of his work; but, in so doing, I am adopting a course which I am most anxious to see followed, in similar circumstances, by authors of more established reputation, and in regard to works of more authority and importance.

Page 11, line 16, for *prunes* read *sloes*.
„ 44, „ 4, for *zingib.* ʒj read ʒij.
„ 44, „ 4, for *Ammoniaci* ʒj read ʒij.
„ 70, „ 7, for *one part* read *one ounce*.

There are also several trifling literal errors, which, as they are not likely to lead to any practical mistake, need not be noticed here.

I am, Gentlemen,
Your obedient Servant,
THE EDITOR OF "THE POCKET FORMULARY."

EFFICACY OF IODINE AND ALTERATIVE DOSES OF MERCURY, IN THE CURE BOTH OF THE PRIMARY AND SECONDARY SYMPTOMS OF THE VENEREAL DISEASE.*

BY JOHN WICKENS WEST, M.R.C.S.L.

CASE I.—Elizabeth Foster, æt. 33, became a patient of mine about four months ago. She was labouring under violent pains in her limbs, more especially at night, which deprived her of sleep, ulceration of the tonsils, and a large swelling over the tibia of the right leg, and another on the os frontis, both of which were very painful to the touch: in the course of a few days after I first saw her, both swellings were in a state of ulceration. She stated that she had contracted the primary symptoms about two years before, but of which she got cured without much difficulty. After some time she was attacked with pains in her feet, elbows, and shoulders, with a constant inclination to vomit: these symptoms lasted for some days, and then an eruption appeared on the breast and arms. This was quickly followed by sore throat and pains in her limbs, especially at night. She took a variety of medicines prescribed by various practitioners, but still the symptoms increased. I ordered her the following:—

℞. Tinct. iodinii ℳxv. ex cyatho aquæ ter quotidie.
℞. Pil. Hydrarg. gr. iss.;
Pulv. Doveri, gr. iij.;
Conf. Rosæ q.s. ut fiat pil. nocte maneque sumend.
℞. Solut. Chlorid. Sodæ, ʒiss.;
Aquæ Puræ, ʒiv.
Fiat gargarisma frequenter in die utend.

I continued this plan without the slightest alteration, for two months, during which time the symptoms generally improved, and at length entirely yielded. The ulceration of the tonsils, and the sores on the leg and forehead, healed. The pains in the limbs ceased. She passed quiet nights, her health quickly improved, and she is now quite recovered.

She had not left her bed, except for a few minutes at a time, for three-quarters of a-year; and her house for more than two years.

CASE II.—A gentleman applied to me in May, 1840, with a large chancre on the glans penis, which he had caught a month before, and for which he had been taking mercury ever since: its character was unhealthy, with a hard base and considerable irritation of the surrounding parts. He had lost his appetite, and was suffering from debility to a very great degree. I prescribed the following mixture:—

℞. Sulph. Quininæ, gr. vj.;
Acid. Sulph. Dilut. ʒiss.;
Inf. Rosæ, ℥vj.
Fiat mist. cujus capiat cochl. duo magna bis quotidie.

His health considerably benefited by this plan, but the chancre remained unhealthy, and without any disposition to heal.

A month after I first saw him he complained of sore throat, which was followed by a copper colored eruption on his body; the chancre continuing the same, I determined on giving him—

℞. Tinct. Iodinii ℳxv. ex cyatho aquæ ter die sumend.

He came to me a week after he had been taking the above medicine, and I found the sore throat better, and the eruption fast disappearing: the chancre was likewise much improved.

I recommended him, in addition to his medicine, to change the air for a short time, which he accordingly did. He returned in three weeks with his health much improved: the chancre had healed; the sore throat and the eruption had entirely disappeared.

CASE III.—William Monk, æt. 36, called on me in December, 1840, with an eruption on his skin, pains in his limbs, ulceration of the soft palate, and a node on the left shin. He stated he had had chancres two years pre-

* Extracted from *The Medical Gazette* of Oct. 22.

viously, for which he took pills of a druggist, and soon got cured. I ordered him—

R. Tinct. Iodinii ℳxx. ex cyatho aquæ ter quotidie.
R. Pil. Hydrarg. gr. iss.;
Pulv. Doveri, gr. iij.;
Conf. Rosæ, q.s.
Fiat pil. nocte maneque sumend.

Nov. 1st.—Has been taking the above for ten days, and finds the pains in his limbs relieved, and the eruption less, but the other symptoms as before.

12th.—The ulceration of the palate healing, and the other symptoms entirely removed.

18th.—Quite recovered.

Case IV.—William Hewlitt, æt. 22, contracted the primary symptoms of syphilis in April 1839. He had an unusually large chancre, which involved nearly the whole of the glans penis. The glands in the groin were enlarged, and very tender and painful. I prescribed for him the following:—

R. Pil. Hydrarg. gr. iij.;
Pulv. Doveri, gr. iv.;
Conf. Rosæ, q.s.
Fiat pil. nocte maneque sumend.

He persevered in the above for some time without much alteration in the state of the chancre, and I then administered iodine, which, in conjunction with the pills, had the effect of soon recovering him.

Case V.—William Martin, æt. 52, consulted me June the 10th, 1840, in consequence of an ulceration at the back part of the fauces, leprous eruption on the legs and arms, and a painful swelling on the tibia of the right leg. He informed me that, about two years ago, he had chancres and gonorrhœa, and a suppurating bubo, but which all yielded to treatment.

I prescribed the tincture of iodine and pills, as in the other cases, with equal success; the symptoms disappearing by the end of two months.

Case VI.—J. R., æt. 26, became my patient on the 6th of Sept., 1840, with a large Hunterian chancre near the frænum, and an inflamed gland in the left groin approaching to a state of suppuration. I recommended poulticing the groin, and gave him simply an aperient mixture.

13th.—The chancre more healthy, with a disposition to heal, and the bubo suppurating freely.

June 6th.—The chancre healed, but the ulcer in the groin has spread, and assumed a phagedenic appearance, which continued to increase until the 18th. I ordered—

R. Tinct. Iodinii ℳxx. ex aqua, ter quotidie.
R. Pil. Hydrarg. gr. ij.;
Pulv. Doveri, gr. iij.;
Conf. q.s.
Fiat pil. nocte maneque sumend.

The ulcer improved under this plan.

26th.—A small swelling has made its appearance in the right groin, but the ulcer in the left nearly healed. As there is a disposition to ptyalism I omitted the pills, and continued the tincture of iodine.

July 2d.—The ulcer in the left groin has healed, and the swelling in the right subsided.

The cases which I have related are, I think, sufficient to shew that it is the combined influence of iodine and mercury which has the effect of removing both the primary and secondary symptoms of syphilis. In all cases where chancre was present I relied on the constitutional treatment without local applications; and I had the satisfaction of finding it successful. I am aware that iodine by itself has succeeded in curing some severe cases of secondary symptoms; but I do not think it can be so much depended on, in all instances, as when it is given with alterative doses of mercury. The symptoms affecting the general system, where the primary or local disease has not been treated with mercury, it will answer as well.

ON THE EMPLOYMENT OF THE DECOCTION OF SOOT IN A CASE OF SEVERE BURN.*

BY DR. EBERS.

A young girl, about the age of puberty, in an epileptic fit, fell upon the fire. The back part of the fore-arm, all the hand, and the left side of the neck, from the base of the lower jaw to the inferior half of the breast of the same side, were severely burnt, with great destruction of the skin. Amputation of the arm was proposed, but the parents refused permission. The sloughs separated at the end of three weeks. The bones were charred in several places. Notwithstanding the employment of astringents, and a generous diet, the patient began to sink from the profuse discharge. Dr. Ebers then determined to try the effect of the decoction of soot, in the cicatrization of the wound. A handful of soot was boiled in eight pounds of water, until the fluid was reduced to lbij. Lint was then soaked in it, and applied to the granulating surface. The next day, instead of the enormous secretion of pus which had formerly taken place, the lint was hardly wet through; the surface of the sore was red and level; the granulations were depressed, and the circumference of the ulcer was surmounted by a cicatrix of two lines in breadth. In eight days, the whole extent of the wound, with the exception of those points at which the bones were exposed, was

* *Journal de Méd. Pratique de Bourdeaux; and London and Edinburgh Monthly Journal of Medical Science.*

covered by a smooth and level cicatrix. Stimulant applications were then applied to the naked bones, and as soon as they were covered by granulations, cicatrization was effected in an equally rapid manner, by the decoction of soot. The patient was cured of her epileptic fits, by the flow of the catamenia taking place.

It seems impossible to deny the effect of the soot in the case just mentioned. It is not likely, however, that it will be found equally successful in the hands of all who try it. If it always has the power ascribed to it here, it would be a dangerous remedy in those cases of suppuration of long standing, in which, from a sudden cessation of the discharge, the constitution is so apt to suffer. It appears to have acted as a stimulant; and it may be useful instead of the nitrate of silver, or sulphate of copper, in cases where they are used to keep down flabby granulations.

FORMULA FOR THE USE OF CREOSOTE IN TOOTHACH, AND AS A WASH FOR THE GUMS.*

BY DR. RIGHINI.

The following substances are mixed in certain proportions:—Alcohol, 16 grammes; creosote, 24 grammes; alcoholic tincture of cochineal, 8 grammes; peppermint oil, 12 drops. This preparation must be kept in a stoppered phial. It may be applied on cotton in the cavities of carious teeth; or a wash for the gums may be formed by adding a few drops of it to a little water.

A NEW REMEDY AGAINST LEPROSY.†

BY M. MERAT.

M. Mérat, at the Academy of Medicine, on the 14th of August, read a report upon a root named Huichunchilly, (we do not guaranty the orthography,) which had been introduced into France by Mad. Ribi, from South America, and which was stated to be exceedingly useful in the treatment of lepra. Dr. Robinson said that it had been attended with great benefit in the treatment of this disease in the Antilles. The price of an ounce was *one thousand* francs!

TWENTY-SEVEN PERSONS POISONED BY EATING DISORDERED VEAL.

About nine weeks since, a farmer named Schofield, residing in the further side of Scotland, had a calf dropped, which he wished to rear, but as it became disordered, he employed a cow-leech, who doctored it about four weeks, at the end of which time it was handed over to a butcher named Kershaw, who killed it, and sold the meat in cheap lots, at 2½d. and 3d. per lb., to people chiefly in the neighbourhood of Whitworth, all of whom were taken more or less ill immediately after eating it. Amongst the rest were a decent working family named Sprawel, to whose share fell the head and mid-calf. The former they boiled for dinner on Sunday week, and, like all the others, they were taken ill the same day, the meat having only been sold on the Saturday. The family consisted of old James Sprawel, nearly 70 years of age, his wife, and several mature sons and daughters; and the old woman was the only one who was not seriously affected by the food, she having only taken a small portion of the broth. James, the old man, began to vomit immediately after he had finished his dinner, and he continued in the same sickly state until Thursday week, when he died. One of the sons, also, at present remains in a rather dangerous condition. On Tuesday last an inquest was held on the body by Mr. Dearden, when, after a patient investigation, a verdict was returned which legally exonerated the vendors of the disordered meat; they were, however, called into the inquest-room and severely admonished, being also informed at the same time that, if another death ensued from a similar cause, it would probably be the painful duty of the jury to send them to Kirkdale, for trial. The number of persons thus poisoned was about twenty-seven.

TO SUBSCRIBERS AND ADVERTISERS.

The Chemist, for the present year, forming Volume Second, will be completed early in December, when our Subscribers are recommended to complete their volumes without delay, to prevent disappointment. The Publisher will give full price to any gentleman possessing numbers I, III, and IV. of Vol. I.

Nota Bene.—*All Communications and Books for Review must be addressed, "To the Editors of The Chemist, care of Mr. Hastings, Publisher, 13, Carey-street, Lincoln's Inn Fields, London." Communications must be pre-paid, and sent before the 15th of each month; Books for Review, before the 10th.*

Erratum. In our last Number, page 308, bottom of column 2, *read* Spermaceti ½ lb. (half pound).

* *Journal de Chimie Médicale.*

† *Gazette Médicale de Paris, 21st August, 1841, and Lond. and Edin. Monthly Journal of Medical Science.*

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THE CHEMIST.

I. CHEMISTRY.

ON THE ACTION OF NITRIC ACID ON STEARIC AND OLEIC ACIDS, AND ON THE PRODUCTS WHICH RESULT FROM IT.*

BY M. C. BROMEIS.

ACTION OF NITRIC ACID ON STEARIC ACID.

M. Chevreul, in his *Chemical Investigations concerning Fatty Bodies*, states that with the aid of heat, nitric acid attacks stearic acid, and that the acid solution deposits by evaporation a substance of a yellowish white, soluble in water, very acid, and containing an acid matter. When one part of stearic acid is treated with two or three parts of nitric acid, with heat, after a little time, a very vivid action is set up, and much binoxide of nitrogen is disengaged, accompanied by another gas which powerfully irritates the respiratory organs. The action very soon subsides, the stearic acid becomes more fluid, and solidifies, forming a mass of the consistence of tallow, and which melts, according to the duration of the operation, between 35° and 40° C.

Margaric Acid.—It is contained in altered stearic acid, mixed with an oily substance, which is easily saponified, assuming a red color.

By removing the nitric acid from this crude product by means of boiling water, and afterwards dissolving it in alcohol, margaric acid is separated and precipitated, in the crystalline state, on cooling. By crystallizing it two or three times in alcohol, pressing and saponifying the product, then decomposing the soap by an acid, a perfectly white matter is obtained, which melts exactly at 60°C., and which presents all the properties of margaric acid. This is fully confirmed by analyses. Indeed 0gr. 4573 of melted acid gave :—

Water . .	0·5123gr.
Carbonic Acid .	1·2475

which furnishes in hundredths :—

Carbon . .	75·43
Hydrogen . .	12·45
Oxygen . .	12·12
	100.00

Calculation gives :—

Carbon . .	75·64
Hydrogen . .	12·71
Oxygen . .	11·65
	100.00

The formation of margaric acid by the oxidation of stearic acid is explained in a very simple manner, by admitting that the latter takes two atoms of oxygen, one of which enters into the constitution of the acid, and the other combines with an equivalent of hydrogen, to form water, which is eliminated.

Indeed we have :—

$$C^{68} + H^{138}, O^7 \left\{ \begin{matrix} \\ - H^2 + O^2 \end{matrix} \right\} = 2\,(E^{34}\,H^{66}\,O^4) + H^2\,O,$$

which corresponds with the composition of two atoms of hydrated margaric acid.

I confirmed this decomposition by the following experiment :—

By treating a small quantity of perfectly pure stearic acid, during half an hour, by concentrated boiling nitric acid, the acid employed was entirely converted into pure margaric acid.

If stearic acid be treated for several days, by boiling nitric acid, it finally disappears, and a limpid, acid solution is obtained, which contains, besides suberic acid, a very large proportion of almost pure succinic acid.

Suberic Acid.—When the acid solution is evaporated to one-half, at the end of about 24 hours, it becomes an almost solid mass. It is purified from the supernatant liquor by washing with cold water, several crystallizations in hot water, pressing, and desiccation. Thus prepared, it is white and inodorous, and presents all the chemical properties of the acid, which is obtained from the stearic acid. Dried at 100° C., it does not enter into fusion below 120°C.

* *Annales de Chimie et de Physique*, Sept. 1841.

The calcination of the salt of silver gives :—

Oxide of silver .	57·20
Acid .	42·80
	100.00

The analysis of the same salt gives in hundredths :—

Carbon .	26·05
Hydrogen .	3·36
Oxygen .	13·39
Oxide of silver .	57·20
	100.00

Whence the formula

$$C^8\,H^{12}\,O^3,\,Ag\,O.$$

The analysis of the free acid, dried and melted, leads to the formula—

$$C^8\,H^{12}\,O^3,\,H^2\,O,$$

whence it is evident that, in salts, one equivalent of water is replaced by one equivalent of metallic base.

Succinic Acid.—By evaporating the washing water of the suberic acid, I obtained a very white crystalline matter, which appeared to be a peculiar substance. Its atomic composition perfectly agrees with that of succinic acid.

In order to convince myself of the identity of the acid thus obtained, with natural succinic acid, I made comparative reactions, all of which fully confirmed my supposition. It is particularly in the washing waters of the suberic acid, as well as in the supernatant liquors of the product of the action of nitric acid, that succinic acid is found. It is obtained by slow evaporation: by cooling it deposits, accompanied by a large quantity of suberic acid, under the form of a white crust, and in large grains which adhere to the bottom of the vessel.

By means of several crystallizations in water, and by means of boiling ether which dissolves scarcely any succinic acid, and a large quantity of suberic acid, it may be freed from the latter. Crystallized in water, this acid is presented under the form of perfectly white grains, which, examined with a magnifying glass, exhibited tables collected in groups. Dried at 100° C., it enters into fusion between 170° and 175° C. (the natural acid melts at 178°); on cooling, it becomes a transparent and radiated mass; at a few degrees above its point of fusion, it sublimes in white needles of a silky lustre. It is by sublimation that succinic acid may be obtained in its greatest state of purity. Indeed, this acid is sublimed first, and condenses on the upper parts of the vessel, in the state of fine transparent tufts. By a new sublimation, it is obtained in a purer state than by any other process, and even amber does not yield it of so fine a quality. The solution of its ammoniacal salt does not cause any precipitate in the solution of chloride of barium, of calcium, and of sulphate of copper; it forms white precipitates in the neutral salts of lead, zinc, and silver.

The analyses of the free acid and of the salt of silver, lead to the formulæ—

$$C^4\,H^4\,O^3 + H^2\,O,$$
$$C^4\,H^4\,O^3 + Ag\,O.$$

These results show, in the clearest manner, the identity of the artificial succinic acid with that which occurs in nature.

When the composition of succinic acid is compared with that of stearic acid, from which it is formed, or with that of suberic acid, which is produced at the same time as it, it seems that succinic acid is formed by the effect of the energetic oxidation to which suberic acid is subjected, under the influence of nitric acid.

Indeed, we have

$$C^8\,H^{12}\,O^3 \Big\} = C^8\,H^8\,O^6 + H^4\,O^3 = 2\,(C^4 - H^4 + O^5 \Big\} \qquad H^4\,O^3,\,H^2\,O).$$

It may be obtained from both stearic acid and margaric acid, which is the first product of the reaction.

2 atoms of margaric acid	$C^{68}\,H^{132}\,O^6$
7 atoms of suberic acid	$C^{56}\,H^{84}\,O^{21}$
3 atoms of succinic acid	$C^{12}\,H^{12}\,O^9$
	$C^{68}\,H^{28}\,O^{30}$
	$- H^{28}\,O^{24}$

Nitric acid therefore furnishes 42 atoms of oxygen, 24 of which are employed in effecting the conversion of margaric acid into suberic and succinic acids, while the other 18 form water with 36 atoms of hydrogen. Thus succinic acid may be reckoned among the matters which the chemist can prepare artificially.

It is probable that amber itself is a product of the slow combustion or decay of some oil or vegetable fatty body. Perhaps mellitic acid, which much resembles succinic acid in its composition, and mellite, owe their formation to an analogous action. What speaks in favor of this fact is the latter being met with in coal mines.

Action of nitric acid on oleïc acid.

The action which nitric acid exerts on oleïc acid is analogous to that which the same agent has on stearic acid, except that it is more vivid and more energetic.

I have ascertained that the concentration of the acid does not modify the results, but the action is more or less slowly accomplished.

Oleïc acid is neither thickened nor resinified (*résinifié*) as M. Laurent sometimes observed. It becomes more and more fluid and colorless, gradually diminishing in volume, and, finally, entirely disappearing, if care be taken to renew the additions of nitric acid in a suitable manner.

The nitric acid that is distilled in this operation possesses a peculiar odor which does not disappear when the acid is neutralized by ammonia or carbonate of soda. By distilling the liquid neutralized with carbonate of soda, a light, limpid, and very fluid oil was ob-

tained, but the quantity was too small to be examined.

Margaric Acid.—If, after the first action of nitric acid, the operation is stopped, the oleïc acid sets, and gives, at the end of eighteen hours, a semi-solid, yellowish mass, traversed here and there by crystalline scales. Treated by boiling water, crystallised several times in alcohol, saponified and separated by an acid, this matter gives a white, brittle, crystalline acid, fusible exactly at 60° C. I analysed this substance: it had exactly the same composition as margaric acid.

The formation of margaric acid, in this reaction, still seems to me doubtful, for the quantity of the product obtained was very small, and the oleïc acid employed was not quite free from stearic acid.

In an experiment made with perfectly pure oleïc acid, I obtained neither margaric nor elaidic acid, but a solid white acid fusible at 80° C., which solidified at 70° C. With potassa this acid gave a red soap, and when the latter was decomposed by an acid, there separated only a small quantity of a thick, brown oil, liquid at the ordinary temperature.

By operating in the same manner, M. Laurent says he obtained elaïdic acid; however, he has pointed out neither the composition of the acid thus prepared, nor its point of fusion. The indication of these would have been so much the more important, as, according to M. Laurent, the composition of elaïdic acid differs only one atom of carbon, that is, 0·5 per cent. from that of margaric acid, as established by Varrentrapp.

Suberic Acid.—The nitric solution of oleïc acid contains, besides several acids found by M. Laurent, suberic acid, which may be isolated in the following manner:—

The product of the reaction of nitric acid on oleïc acid, when all action has ceased, becomes, at the end of twelve hours, and at 0°C. a crystalline mass, which is almost entirely composed of suberic acid, and of an oil soluble in alcohol, as well as of a small quantity of pimelic acid.

In order to remove the suberic acid, the whole is poured into a large funnel, the end of which is partially stopped with a glass rod. The supernatant liquor flows out, and may be entirely removed by washing in cold water.

After having crystallized it several times in boiling water, and after having pressed and dried it, suberic acid is obtained in a state of perfect whiteness.

This acid, thus purified, melts at 120°, and, on cooling, becomes a mass composed of very fine needles.

Heated in a flask it produced vapors which condensed in drops, which became crystalline by cooling: at the same time, it left a carbonaceous residue.

The ammoniacal salt did not precipitate the solutions of chloride of barium, strontium, and calcium, except when alcohol was added: it immediately occasioned white precipitates in the solutions of the neutral salts of silver, mercury, zinc, and tin. The suberate of ammonia likewise caused a blue precipitate in sulphate of copper, and a reddish brown one in sulphate of peroxide of iron.

I analysed the free suberic acid, as well as the suberates of soda, lead, and silver: this composition may be represented by means of the following formulæ:—

Hydrated suberic acid ..$C^8 H^{12} O^3, H^2 O$
Suberate of soda .....$C^8 H^{12} O^3, Na O$
Neutral suberate of lead...$C^8 H^{12} O^3, Pb O$
Basic suberate of lead....$C^8 H^{12} O^3, 3 Pb O$
Suberate of silver.....$C^8 H^{12} O^3, Ag O$
Suberate of oxide of ethule $C^8 H^{12} O^3, C^4 H^{10} O$

I prepared the suberate of oxide of ethule by passing a current of hydrochloric acid gas into a solution of suberic acid in alcohol. The ether separates during the operation. It is obtained perfectly pure by agitating it with water, and afterwards leaving it over chloride of calcium. It easily distils without being altered, and possesses the peculiar apple smell which is peculiar to the ethers of the fatty acids.

Pimelic Acid.—This acid is met with more particularly in the washing waters of the suberic acid, and in smaller quantity in the nitric mother-liquor, whence it is extracted by gentle evaporation. Crystallised several times in water, it occurs under the form of white grains, partly agglomerated, and essentially different from suberic acid. Dried at 100° C., it enters into fusion at 134° C., and readily sublimes in very beautiful silky tufts. It is rather more soluble in water than suberic acid. Its ammoniacal salt precipitates neither the solutions of the chlorides of calcium, strontium, or barium, nor that of sulphate of copper.

I submitted the free acid to analysis, as also the salt of silver. Their composition may be expressed by the following formulæ:—

Hydrated pimelic acid ....$C^7 H^{10} O^3, H^2 O$
Pimelate of silver.....$C^7 H^{10} O^3, Ag O$

These results perfectly agree with those of M. Laurent; I will only remark that his acid fused at 114° C., and that his ammoniacal salt precipitated the solution of sulphate of copper.

Adipic Acid.—This acid is obtained by the evaporation of the nitric mother waters. Crystallised in water, this acid occurs under the form of grains collected in groups. Dried at 100° C., it enters into fusion at 145° C., and sublimes as easily as pimelic acid. It is very soluble in water, alcohol, ether, and nitric acid. The solution of its ammoniacal salt does not precipitate the solutions of chloride of barium, calcium, sulphate of copper, or acetate of lead; it forms, on the contrary,

a white precipitate in the solution of nitrate of silver.

Submitted to analysis, this compound gave me numbers which lead to the formula

$$C^{14}\,H^{28}\,O^{9}.$$

The analyses of the salts of baryta and silver led me to look upon this compound as a bibasic acid. We have then

Free acid ..... $C^{14}\,H^{18}\,O^{7}+2\,H^{2}\,O$,
Adipate of baryta..... $C^{14}\,H^{18}\,O^{7}+2\,Ba\,O$,
Adipate of silver..... $C^{14}\,H^{18}\,O^{7}+2\,Ag\,O$.

The composition of this acid, as I have established it, varies considerably from that which M. Laurent has admitted: this difference is no doubt owing to that chemist having examined only the free acid and its salt of baryta, and to his not having burned the latter with the oxide of copper. My analysis of the free acid entirely agreeing with M. Laurent's, I consider myself so much the more warranted in regarding the new formula as correct.

Lipic Acid.—This acid is found in the brown and thick mother water which is obtained by decanting and pressing the pimelic acid. By the evaporation of this liquid, it is deposited, at the end of some time, under the form of transparent and very bulky lamellæ.

This acid, which I obtained only in very small quantity, was decomposed by the evaporation of the nitric solution, which prevented me from examining its composition.

Azoleïc Acid.—When oleïc, margaric, or stearic acid is treated, we obtain, among other products, a peculiar acid, whose formation was indicated by M. Laurent, and to which he gave the name of *azoleïc acid*.

The products which I have obtained, whether by means of pure or crude oleïc acid, or by means of stearic acid, having been submitted to analysis, gave me results which lead to the formula

$$C^{14}\,H^{28}\,O^{4}.$$

I etherified this acid by employing the method which I described for the formation of suberic ether. The composition of this ether may be represented by

$$C^{18}\,H^{36}\,O^{4} = C^{14}\,H^{26}\,O^{3},\ C^{4}\,H^{10}\,O.$$

M. Laurent thought he had obtained, in his investigations, œnanthic acid; however, I have ascertained, by a great number of experiments, that the body which he took for œnanthic ether was only a mixture of azoleïc ether and sulphuric ether, which possesses, it is true, the odor of œnanthic ether.

If we compare the composition of oleïc and stearic acids with that of the bodies which are produced by the oxidation of these acids under the influence of nitric acid, we remark that the production of the latter takes place by virtue of a direct oxidation analogous to the phenomena of decay or of slow combustion.

Indeed, we have from oleïc acid

2 atoms of oleic acid...	$C^{36}\,H^{156}\,O^{6}$
3 atoms of suberic acid.	$C^{24}\,H^{36}\,O^{9}$
3 atoms of pimelic acid.	$C^{21}\,H^{3}\,O^{9}$
3 atoms of lipic acid...	$C^{15}\,H^{18}\,O^{12}$
1 atom of adipic acid..	$C^{14}\,H^{18}\,O^{7}$
1 atom of azoleïc acid..	$C^{14}\,H^{26}\,O^{2}$
	$C^{88}\,H^{124}\,O^{40}$
	$-\,H^{28}\,O^{32}$

or indeed, from stearic acid

1 atom of stearic acid...	$C^{68}\,H^{162}\,O^{6}$
1 atom of suberic acid..	$C^{8}\,H^{12}\,O^{8}$
2 atoms of succinic acid..	$C^{8}\,H^{8}\,O^{6}$
2 atoms of pimelic acid	$C^{14}\,H^{20}\,O^{6}$
2 atoms of adipic acid..	$C^{28}\,H^{36}\,O^{14}$
2 atoms of lipic acid..	$C^{10}\,H^{12}\,O^{8}$
	$C^{68}\,H^{88}\,O^{37}$
	$-H^{44}+O^{32}$

In the case of oleïc acid, it is evident that 46 atoms of oxygen are absorbed; 14 unite with 28 of hydrogen to form water, while the 32 other atoms remain in combination with the products of the oxidation.

In the case of stearic acid, 21 atoms of oxygen form water with 42 atoms of hydrogen, while 32 enter into combination with the products of the oxidation.

This mode of representing the oxidation of fatty bodies cannot be strictly accurate, seeing that I have not been able to ascertain the quantity of the products obtained.

Action of Nitric Acid on the Siccative Oleïc Acid of Linseed Oil.

The reaction which is manifested in this case is more violent than with the oleïc acid of the unctuous oils. The mass thickens and becomes viscous like oil varnish; very soon after, it becomes fluid, and at the end of twenty-four hours, it fries into a semi-solid mass. By treating this mass with boiling water, and by dissolving it twice in hot alcohol, I obtained a small quantity of a white acid completely resembling margaric acid. After having been saponified and reprecipitated, it entered into fusion at 56° C.

The nitric solution contained a very considerable quantity of suberic acid, which, after two crystallisations in water, presented all the properties of that acid, and which, dried at 100° C., fused exactly at 119° C. The mother-liquor did not yield, as in the other fat acids, pimelic, adipic, acids, &c., but a great quantity of pure oxalic acid, which essentially distinguishes siccative oleïc acid from the other fatty acids.

INVESTIGATIONS CONCERNING THE PRODUCTS WHICH RESULT FROM THE ACTION OF NITRIC ACID ON CASTOR OIL.*

BY M. T. G. TILLY.

The action of nitric acid on the fat acids, has recently been made the subject of researches by MM. Laurent and Bromeis, and the interesting results obtained by them having attracted the attention of chemists, professor Liebig engaged me to examine in his laboratory the products which result from the oxidation of castor oil, which differs in so remarkable a degree from other fixed oils.

One part of this oil was mixed with twice its weight of nitric acid, and an equal bulk of water, and the retort which contained the mixture was submitted to a gentle heat. After a short time, the action became very violent, and gases were formed in such abundance, that all the matter contained in the retort escaped.

It should then be withdrawn from the fire, in order that the action may proceed gradually. If the retort be placed on the fire, a sandbath must be used, in order that the action may be less violent. This means of oxidation should be continued several days, more or less, according to the strength of the acid employed. When the nitrous vapours diminish, the retort must be withdrawn from the fire. There is then found in the receiver nitric acid, water, and a peculiar volatile acid oil which forms the subject of the following columns. By adding water to the fatty mass which remains in the retort, and by distilling the mixture, a fresh quantity of this acid oil is obtained.

It must then be separated from the acid on which it floats, mixed with the water and redistilled. This process should be repeated several times, after which, it must be dried by being spread over fused phosphoric acid: chloride of calcium cannot be used, on account of its solubility in the acid.

The acid which is procured by this method is quite colorless and transparent; it has an agreeable aromatic odor and a sweet, piquant taste. It is not very soluble in water, and communicates to that liquid its peculiar odor. It is soluble in nitric acid, alcohol, and ether. It begins to boil at 148° C., and a small quantity is distilled over; but if the temperature is maintained for some time, it turns black, is decomposed, and gives empyreumatic products; whence it is evident that it cannot be distilled alone. It burns with a clear flame, and does not solidify at —17. I have given to this compound the name of *œnanthylic acid*, for reasons which I shall give further on.

Burnt with oxide of copper, this compound gave the numbers which lead to the formula:

$$C^{14} H^{14} O^4.$$

Œnanthylic Ether.— This ether is obtained by dissolving the acid in absolute alcohol and by passing a current of hydrochloric acid gas through the solution. Carbonate of potassa must be added to the product of the reaction, in order to neutralise all the acid; it must then be distilled. The ether then passes into the receiver, and may be freed from the alcohol which it contains by agitating it with water. Finally, it must be distilled over chloride of calcium, in a current of carbonic acid gas, on account of the decomposition which it undergoes by means of the oxygen of the atmosphere, at its boiling temperature.

Œnanthylic ether, thus prepared, is a colorless liquid, lighter than water, leaving a peculiar, agreeable odor, differing but little from that of nitrobenzide. It has a sweetish and rather piquant taste which leaves a disagreeable sensation on the palate. It is soluble in alcohol and ether; it burns with a clear blue flame free from smoke. It solidifies under the influence of the cold produced by a mixture of snow and salt, and is then presented in the crystalline form.

Submitted to analysis, the compound gave the numbers which accord with the formula

$$C^{18} H^{18} O^4.$$

Let us now suppose that this ether is composed of 1 at. oxide of ethule, and of 1 at. anhydrous acid, we shall have for the composition of the latter,

$$C^{14} H^{13} O^3;$$

and by adding to it 1 at. water to form the hydrate, we have

$$C^{14} H^{13} O^3 + HO.$$

Œnanthylate of Potassa is obtained by neutralising the carbonate of this base with œnanthylic acid; it does not crystallise: by evaporation it assumes the form of a thick and transparent jelly.

The salt of copper crystallises in beautiful needles of a very rich green. It is soluble in alcohol, and not very soluble in water.

The œnanthylate of strontia is presented under the form of brilliant pearly scales, much resembling the salt of baryta.

It results then from the preceding analysis, that the composition of the anhydrous acid is

$$C^{14} H^{13} O^3,$$

and that it enters into the following combinations:—

Œnanthylate
of water ..... $C^{14} H^{13} O^3 + HO$;
of oxide of ethule $C^{14} H^{13} O^3 + C^4 H^5 O$;
of baryta ..... $C^{14} H^{13} O^3 + Ba O$;
of silver ..... $C^{14} H^{13} O^3 + Ag O$.

It has been ascertained, of late years, that wine owes its peculiar odor to a certain acid in combination with oxide of ethule. MM. Pelouze and Liebig, who discovered this acid, gave it the name of œnanthic acid. This acid has the following composition:—

$$C^{14} H^{13} O^2 + Ag.$$

* *Annales de Chimie et de Physique*, Troisiéme Série; Sept, 1841.

The analogy which exists between this acid and that which I have described is readily perceived: the composition of these two acids would lead us to suppose that they are oxides of the same radical, which would be represented by $C^{14} H^{13}$; whilst the two acids would be respectively representing the radical by R,

$$R + 2O,$$
$$R + 3O.$$

According to this hypothesis, I have given to the latter, the name of *œnanthylic acid*, and I propose for the acid discovered by Pelouze and Liebig, the name of *œnanthylous acid*, which perfectly accords with the numbers deduced from the analysis of the acid.

Œnanthylate of Silver.—This salt may easily be prepared by a neutral solution of the acid in ammonia, and nitrate of silver. It precipitates under the form of white pulverulent flocks.

0·7165 of this salt give, by calcination, 0·3265 of metallic silver, which represent 0·3509 of oxide of silver. This gives, per cent.—

Oxide of silver.....	48·89
Œnanthylic acid	51·11
	100·00

which leads to the number 1517 for the atomic weight of the anhydrous acid. Calculation gives 1532·33.

By burning, by means of oxide of copper, the salt dried *in vacuo*, over sulphuric acid, numbers are obtained which lead to the formula

$$C^{14} H^{13} O^3, Ag\ O.$$

Œnanthylate of Baryta.—This salt is obtained by boiling carbonate of baryta with an alcoholic solution of œnanthylic acid until the liquor no longer has an acid reaction.

The liquor should be filtered while it is warm: on cooling, this salt is deposited under the form of very brilliant pearly scales, which are insoluble in ether, but soluble in alcohol and water. This salt contains, per cent.—

Oxide of barium	38·23
Œnanthylic acid	61·77
	100·00

The formula which agrees best with this analysis is the following:—

$$C^{14} H^{13} O^3, Ba\ O.$$

It is not impossible that œnanthylic acid may be identical with the azoleïc acid of M. Laurent; but he did not obtain it in a very pure state.

When œnanthylate of silver is submitted to distillation, there passes into the receiver an oil and a solid body, neither of which possesses acid properties. The solid body is soluble in hot alcohol, and crystallises, on cooling, under the form of beautiful needles.

Suberic acid is another product of the oxidation of castor oil; it remains in the retort mixed with oxalic acid; it may be purified by repeated crystallisations, and by boiling with nitric acid.

Submitted to analysis, it gave numbers which lead to the formula—

$$C^8 H^7 O^4, \text{ or } C^8 H^6 O^3 + HO.$$

The other acids found by M. Laurent do not appear to be formed in this reaction, but I could not affirm the fact in a positive manner. A small quantity of lipic acid may, however, be obtained by the evaporation of the supernatant liquors of the suberic acid.

INVESTIGATIONS CONCERNING SEBACIC ACID.*

BY J. REDTENBACHER.

When the product of the distillation of most fatty bodies is treated with boiling water, there is precipitated by the cooling of the liquor, white foliated crystals, to which M. Thenard, who first observed them, gave the name of *sebacic acid*.

To purify this acid, M. Thenard adds acetate of lead to its aqueous solution, and decomposes the precipitate, after well washing it, with hydrosulphuric acid.

Berzelius, who first examined this acid, boiled the products of the distillation of fatty bodies with carbonate of lime moistened with a large quantity of water, and separated the sebacic acid by decomposing the sebate of lime with nitric acid.

Many reactions induced Berzelius to believe that sebacic acid was nothing more than benzoïc acid modified in its properties by the presence of empyreumatic products. What led him to this conclusion, was the manner in which sebate of potassa acts with anhydrous alcohol. Indeed, that salt treated by alcohol, yielded another salt whose acid did not precipitate the salts of protoxide of mercury, nor those of silver; while the acid of the sebate not acted on by alcohol, and the acid of the portion not soluble in that vehicle, precipitated those solutions.

MM. Dumas and Péligot determined the composition of this acid by the analysis of its hydrate and of its salt of silver, employing for that purpose a sample which M. Lecanu prepared by the distillation of fatty bodies: their investigations led them to adopt for the hydrate, the formula

$$C^{10} H^{16} O^3 + H^2 O,$$

the water being capable of being substituted by one equivalent of a metallic base.

I therefore undertook the following investigations, with the view of confirming this composition, and of ascertaining by virtue of what reaction this acid is produced by the distillation of fatty bodies.

I submitted to distillation olive oil and pork

* *Annales de Chimie et de Physique*: Sept. 1841.

fat, and I boiled the product obtained several times with water. On cooling, the latter assumed the form of a pap composed of very fine crystalline needles: the latter extracts always seem to contain a very considerable quantity of sebacic acid: however, its weight is very trifling.

The acid thus obtained was laid on a filter, washed with cold water, and then redissolved in boiling water in order to separate from it a small quantity of fatty matter which always adheres to it. This treatment is repeated until the product is perfectly white and deprived of all empyreumatic odor.

I also boiled the product of the distillation of fatty bodies with water to which I had added a certain quantity of ammonia, then I decomposed the ammoniacal salt thus formed by an acid. By this process, I did not obtain the sebacic acid in larger quantity, nor in a state of greater purity.

Thus prepared, this acid is presented under the form of needles or white, pearly folia, very light, and bearing a strong resemblance to benzoïc acid. It possesses an acid taste and slightly reddens turnsole, does not lose weight at 100° C., fuses at 270°, and sublimes at a higher temperature. Its vapor is irritant and has the odor which is peculiar to the vapor of all the fat acids. It possesses, moreover, all the properties which Berzelius, in his *Traité du Chimie*, assigns to it.

Submitted to analysis, it gave numbers which agree with the formula

$$C^{10}\,H^{18}\,O^{4}.$$

In order to determine its atomic weight, I prepared the salt of silver by precipitating a solution of sebate of ammonia by a solution of nitrate of silver. There was then formed a white, coagulated precipitate, scarcely soluble in water. The calcination of this salt and its combustion by means of oxide of copper have led me to the formula

$$C^{10}\,H^{16}\,O^{3}\,Ag\,O.$$

Whence it follows that the anhydrous acid should have the following composition:—

$$C^{10}\,H^{16}\,O^{3};$$

and that its hydrate should be represented by

$$C^{10}\,H^{16}\,O^{3} + H^{2}\,O;$$

which entirely confirms the composition that MM. Dumas and Peligot have assigned to this acid.

Sebacic acid forms with the alkalis very soluble salts, with the earths and metallic oxides, precipitates which are very little soluble, or quite insoluble, and which are more or less colored, according to the base they contain. I have examined only the salts of potassa and lime.

The sebate of potassa is obtained by neutralizing the carbonate of potassa with sebocic acid. It crystallizes from a concentrated solution in small crystals very soluble in water, not deliquescent, and very little soluble in absolute alcohol. This salt presents the following composition:—

$$C^{10}\,H^{16}\,O^{3},\,KO.$$

I have not succeeded in preparing an acid salt of potassa.

When the neutral salt is treated by an excess of sebacic acid, the latter separates without undergoing any alteration. I have not been able to extract from the neutral salt by anhydrous alcohol another salt whose acid precipitates neither the salt of mercury nor those of silver.

The sebate of soda resembles the salt of potassa; it is rather more soluble.

The sebate of ammonia is very soluble in water, crystallises irregularly, loses ammonia on being dried, and presents an acid reaction.

A not very concentrated solution of chloride of calcium, gives with sebate of ammonia a precipitate of sebate of lime, which is very soluble in water. Its dilute solution crystallises by spontaneous evaporation in the air in very fine shining bractese.

This salt presents the following composition:—

$$C^{10}\,H^{16}\,O^{3},\,Ca\,O.$$

In order to obtain a new means of determining the composition of this acid, I prepared sebacic ether, which was not known before. This compound is easily formed by passing a current of hydrochloric acid gas, to saturation, into an alcoholic solution of sebacic acid. The ether produced is washed with water, mixed with a little carbonate of soda, and is rectified after having been dried over chloride of calcium.

Submitted to analysis, this compound gave numbers which lead to the formula—

$$C^{14}\,H^{26}\,O^{4},$$

which may be decomposed into

$$C^{10}\,H^{16}\,O^{12},\,C^{14}\,H^{10}\,O.$$

After having thus confirmed the composition of sebacic acid and of some of its data, I may conclude with a few words on the mode of its formation. Most fatty bodies of animal or vegetable origin yield sebacic acid when distilled: thus, for instance, beef and pork fat, olive and sweet oils, &c. Stearic and margaric acids, when pure, do not give the least trace of this acid: it is the same with glycerine. Besides these three principles, fats and oils contain only oleïc acid; whence it is necessarily concluded that sebacic acid can only be the product of the distillation of oleïc acid.

When oleïc acid is distilled alone, the product contains, besides other substances, a great quantity of sebacic acid, of which the quantity does not increase, when the oleïc acid employed contains other fixed fat acids. Wax does not yield sebacic acid by distillation, therefore it does not contain oleïc acid. M. Thenard has already indicated the formation of sebacic acid by the distillation of wax, as a means of detecting whether it is adulterated with fatty matter. It is the same with spermaceti.

As sebacic acid is very little soluble in cold water, as it is easily detected, both by its appearance and by its reactions with the salts of lead, mercury, and silver, with which it forms a white precipitate; as it is sufficient to distil a few grammes of a fatty body, and as the extraction by boiling water is very rapidly operated, we are led to admit that sebacic acid is the best reagent for detecting the presence of oleïc acid in a fatty matter. This fact is of particular importance in the preparation of margarine and stearine, the only means which it has hitherto been possible to employ consisting in the saponification of the fatty matter, and the determination of the point of fusion of the fat acid liberated.

The best process which can be employed for the preparation of this acid consists then in submitting to distillation crude oleïc acid, a product of the manufacture of margarine candles.

NOTICE OF A TEST FOR NITRIC ACID IN THE SULPHURIC ACID EMPLOYED IN EXCITING VOLTAIC BATTERIES.*

BY MR. C. V. WALKER, HON. SEC. ELEC. SOC.

All who are in the habit of experimenting with voltaic arrangements, have witnessed the consumption of zinc by local action; and most experimentalists have found that the ordinary means of protection have not in all instances, been effectual in entirely arresting this destructive process; but very few have been aware that the cause of this is not existent in the zinc alone. Many have beheld with surprise the destruction of their plates, after every precaution has been taken to amalgamate them perfectly; and have been astonished that even the pure zinc thus treated is not even safe from the corrosive and profitless action. The unsuspected source of this evil must be sought elsewhere; and is found to be in the impurity of the sulphuric acid of commerce. This acid most commonly contains a small quantity of nitric acid, the presence of which, though it be to a very inconsiderable amount, is highly prejudicial to the purpose for which it is employed. For the nitric acid will immediately attack the mercury, and thus expose portions of the zinc in an unprotected state. These unprotected portions in conjunction with the rest of the surface form elementary pairs, the elements being zinc and amalgamated zinc, and thus give rise to an amount of local action to no inconsiderable extent. These exposed spots form the positive metal in the elementary pair; and very frequently are eaten into holes, entirely through the plate. It is therefore most important to the experimentalist, that he should be on his guard against this, and be enabled to detect the enemy which would thus undermine and counteract his best designed operations. And to none is this more important, than to the electrotypist, whose batteries are in action, not by the hour or day only, but by the week or the month; and to him it is of especial moment when he employs a Smee's battery, or *the constant acid* battery, the whole energy of either depending upon the undisturbed affinity between the acid and the zinc. I am convinced that very often the metallic arrangements have been condemned, when the whole fault lay in the impurity of the acid.

These observations occur from a conversation I held in the laboratory of St. Thomas's Hospital with Dr. Leeson; and to him is due anything of interest or utility which may be gathered from the present notice. It is through his kindness I am enabled to furnish members with the following interesting test for nitric acid; the certainty and value of which he experimentally illustrated on the spot upon two specimens of acid.

Into two clear flasks were placed specimens of sulphuric acid, the one known to be free from nitric acid, and the other suspected to be impure. Some sulphate of indigo was dissolved in distilled water, in quantity sufficient to give it a deep blue tinge, and an equal measure of this solution was poured into each flask upon the acid. The two flasks, with their contents, were then submitted to the heat of spirit-lamps, and after a few minutes, the blue color disappeared from that containing nitric acid, while it remained unimpaired in the other. This test is so simple and effectual as to be available to every one; the operation can be done in a few minutes, and the white or straw-color acquired by the impure specimen, is an infallible test of the presence of nitric acid.

I then examined with Dr. Leeson, several zinc plates which had been used in his experiments, and was surprised at the difference in the condition of those excited with pure and those with impure acid; other things being the same, the former were uniformly acted upon; the latter presented the appearance, with which we are all familiar, of a corroded surface excessively eaten away at parts. Independently of the great loss of electric agency, when the metal is thus destroyed by local action, great waste of zinc must be taken into account. More is consumed in this way than by the ordinary battery action. Theoretically, for every ounce of zinc consumed, nearly an ounce of copper should be released in the decomposition of a salt of that metal; practically, this is far from being the case; the proportion of zinc destroyed to the copper deposited is widely different, it is more commonly two or threefold. On the score then of economy and order, it is advisable that among

* *Proc. Lond. Elec. Soc.*, Sept. 1841.

the precautions taken to ensure regularity of action, should always be included an examination into the purity of the acid. In fact, of so great importance is this, that pure acid supersedes the necessity of employing *pure* zinc; zinc in this condition is not obtained without some considerable consumption of time and labour; but with the acid free from nitric, it is not needed. Dr. Leeson assures me that the ordinary rolled zinc of commerce will do equally well. If this is well amalgamated, (using in the process the pure acid,) and is excited with the same, the action will continue, and there will be no need, as there often is under other circumstances, of re-amalgamation.

Kennington, 13th Sept. 1841.

INVESTIGATIONS CONCERNING THE SERIES OF SALICULE.*

BY M. C. GERHARDT.

It is known that M. Laurent found in coal gas a peculiar body, hydrate of phenyle, which forms the primitive type of picric or carbazotic acid, for its formula is $C^{24} H^{12} O^2$. It is also known that the latter acid is formed by the action of nitric acid on salicine, on hydroguret of salicule and saliculic acid. Now saliculic acid being $C^{26} H^{12} O^6$, or indeed, $C^{24} H^{12} O^2$, $C^4 O^4$, I ought to be able to extract hydrate of phenyle from it.

I was perfectly successful. It is only necessary to distil this acid rapidly after having mixed with it a little powdered glass, or better still, a little lime, and it is thus completely converted into carbonic acid and colorless hydrate of phenyle.

Hydrate of phenyle, thus obtained, crystallises at a low temperature, has the odor of creosote, and is distinguished by its extreme causticity. Concentrated nitric acid attacks it powerfully, and converts it into picric acid.

Saliculic acid yields this body with great readiness, and even when it is impure, it cannot be distilled without furnishing a considerable quantity of it.

Another fact which should attract the attention of chemists is, salicine is directly converted into saliculic acid under the influence of potassa in fusion, and without any necessity of first producing hydroguret of salicule by means of bichromate of potassa and sulphuric acid. Liquid potassa does not decompose salicine, but the latter is vividly attacked, with a disengagement of hydrogen, when it is added to potassa in fusion. There is then obtained, by the employment of an excess of potassa, perfectly white and pure saliculic acid, and by using an excess of salicine, hydroguret of salicule, as well as an acid resin, which appears to form the transitory body between hydroguret of salicule and saliculic acid.

This reaction will probably enlighten me concerning the constitution of salicine.

The formation of the type of hydrate of phenyle being well proved for this series of salicule, it remains for me to pursue the formation of this type or of its compounds in the series of indigo, a substance which, as is known, is likewise converted into picric acid under the influence of nitric acid. In this manner, I shall be enabled to connect these two series; every thing seems, besides, to show that indigotic acid is nothing more than nitro-saliculic acid, $C^{20} H^{11} (N^2 O^4) O^6$, and that Erdmann's chlorindoptic acid is probably identical with M. Laurent's chlorophenesic acid.

In a memoir which I shall soon have the honor of submitting to the Academy, I shall endeavour principally to demonstrate by experiment the intimate connexion which subsists between the series of salicule and that of indigo.

* *Comptes Rendus*, No. 14, Oct. 4, 1841.

INVESTIGATIONS CONCERNING BALSAM OF TOLU.†

BY M. DEVILLE.

Balsam of tolu contains an essence which may be separated by distillation with water. This very complex substance consists of:—

1st. A volatile oil, boiling at about 170° C., whose composition is represented by the formulæ $C^{48} H^{36}$;

2nd. Perfectly formed benzoïc acid, which is developed by time and exposure:

3rd. A substance which all its properties and its elementary composition show to be identical with the cinnamine which M. Frémy obtained by treating balsam of tolu with alcoholic potassa.

If balsam of tolu be distilled on the bare fire, taking all the precautions which this difficult operation requires on account of the continual swelling of the matters contained in the retort, four distinct compounds are obtained:—

1st. Benzoïc acid in considerable quantity:

2nd. In the alcoholic mother liquors of the crystallisation of this acid, a small quantity of cinnamic acid is found:

3rd. An oily substance, boiling at 108° C., whose composition and density of vapor lead to the formula $C^{20} H^{16}$, the same as that which MM. Pelletier and Walter have assigned to their retinaphtha. Retinaphtha and benzoïn should not be considered as isomeric, because their chemical properties are essentially different. Benzoïn gives with sulphuric

† *Société Philomatique de Paris*; Sitting of August 14, 1841: from *L'Institut*, No. 400.

acid an acid whose composition in salts is $C^{28} H^{14} S^2 O^5$, and in the crystallised and free state, $C^{28} H^{14}, S^2 O^5 + H^6 O^6$. Concentrated nitric acid produces, without the aid of heat, with benzoïn, a compound of $C^{28} H^{12} N^2 O^4$, and with heat, after a prolonged action, a crystallised substance, $C^{28} H^{12} N^4 O^8$. Chlorine acts very powerfully on benzoïn. This action is so intense that its first products disappear as they are formed, so that, to obtain them isolated, as they are liquid, it is not known at what time the operation should be stopped. However, M. Deville has obtained the most volatile, which consists of $C^{28} H^{14}, Ch^2$. The action of chlorine being prolonged, we obtain successively $C^{28} H^{10} Ch^6$, $Ch^2 H^2$, then $C^{28} H^{10} Ch^5$, $Ch^4 H^4$, and $C^{28} H^{10} Ch^6$, $Ch^6 H^6$. The last is crystallised, and is identical in composition with M. Péligot's chloride of benzoïn. The last term of this series is $C^{28} H^4 Ch^{12}$. It is crystallised.

4th. Balsam of tolu, when distilled, produces a substance which, by the action of acids, yields benzoïc acid, and under the influence of potassa gives benzoate of potassa and alcohol. On the other hand, it has all the physical properties and the composition of benzoïc ether.

M. Deville has observed that benzine, under the same circumstances which give rise with benzoïn to the compound $C^{28} H^{12} Ch^4 O^6$, furnishes also a crystallised combination of great beauty, $C^{24} H^8 Ch^4 O^6$, which completes the analogy between these two substances.

PREPARATION OF SULPHOCYANURET OF POTASSIUM.*

BY M. A. MEILLET.

The preparation of sulphocyanuret of potassium by alcohol is very expensive, and limits the use of that valuable test for the salts of iron; I therefore endeavoured to procure it in another manner, and I have completely succeeded. The mixture of dried prussiate of potassa and sulphur is introduced into a Hessian crucible, and heated to the state of pasty fusion; the matter is stirred with an iron rod, and then immediately removed from the fire. When the crucible is cooled, the matter is pounded and washed with water instead of alcohol, filtered, and a liquor charged with sulphocyanuret of potassium and a little sulphocyanuret of iron is obtained. The iron is precipitated by means of carbonate of potassa, the liquor is decanted, and if it be alkaline, it may be saturated with a little acetic acid; it is evaporated, and crystallised several times; the acetate of potassa remains in the supernatant liquors.

The first recommendation—that of not heating the mixture beyond the state of pasty fusion, is based on practice: indeed, I remarked that when it was heated, as directed in books, to dull redness, a great quantity of the sulphocyanuret of potassium was decomposed, and a considerable quantity of carbonate of potassa was produced. Now, it is better to have in the liquors a sulphocyanuret of iron which is easily converted into sulphocyanuret of potassium, than carbonate of potassa, which constitutes an actual loss.

If the fire has been too strong, which is very commonly the case, in washing the matter with water, we have a mixture of sulphocyanuret of potassium and carbonate of potassa. Now, as the boiling alkaline solutions decompose the sulphocyanuret into sulphuret of potassium, carbon, which is deposited, and nitrogen, which appears under the form of bubbles, it was necessary to employ alcohol to isolate the carbonate insoluble in this vehicle. It is then requisite to employ a few drops of white pyroligneous acid to saturate the free alkali; it is then evaporated and crystallised. The last mother waters may be treated by acetate of lead: sulphocyanuret of lead is obtained, serving for the preparation of sulphohydrocyanic acid.

Sulphocyanuret of potassium, thus prepared, does not cost more than sixteen francs per kilogramme.

* *Journal de Pharmacie*, Oct. 1841.

BITUMINOUS SHALE.†

A new branch of industry seems likely to organize itself in Belgium. The different produce extracted from bituminous shale, by means of the works established about ten months since, on the banks of the canal, near Lacken, merits the attention of consumers, especially the extracts of oil and charcoal. This last production, of which extensive application has been already made in the sugar-refineries, and particularly in that of M. de Vandenberghe de Binkum, at Tirlemont, may acquire great importance at a moment when the depreciation of sugar cannot be balanced but by a diminution of price upon the original materials of manufacture. A reduction of 30 per cent. on the price of charcoal, fit for refining, would offer an important advantage, and it is to be hoped, that the experiment may prevail over the prejudices of those who, from habit, stop short on the road of improvement. The works of M. de Binkum are open to all manufacturers, who wish to assure themselves, by personal inspection, of the advantages that the employment of this kind of charcoal offers. The shale charcoal possesses, moreover, a disinfecting power, which acts instantaneously on all the animal matters, even the most fœtid, and transforms them into a powerful

† *Le Fanal.*

manure. These two applications of this preparation alone would suffice to assign an important place to this new branch of industry.

REVIEWS.

LECTURES ON CHEMISTRY; *Including its Applications in the Arts.* By HENRY M. NOAD, Lecturer on Chemistry. Part V. London: R. Hastings, Carey Street; and Scott, Webster, and Geary, Charter House Square.

IN the present part, Mr. Noad gives the theory of volumes—the atomic theory, illustrating the doctrines by well chosen examples. He then proceeds to the consideration of the undecompounded non-metallic bodies, commencing with oxygen.

We have room for the following extract:—

"Oxygen gas is essential to animal life, and it is its presence in the atmospheric air which fits that compound for its uses in the economy of nature. The change which it produces in the blood of a living animal may be seen by agitating it with a portion of blood drawn from a vein, the dark color becomes a fine vermilion red, characteristic of arterial blood. Oxygen gas then is absolutely essential to arterialisation, though to maintain animal life it must be diluted.

"An animal can live longer in a vessel of pure oxygen than in the same volume of atmospheric air: nevertheless, its continued respiration in a state of purity is injurious, nay, fatal. A rabbit is found to breathe it without inconvenience for some time, but after an interval of an hour or more, the circulation and respiration are much quickened, and a state of great excitement of the general system supervenes; this is followed by debility, and death occurs in from six to ten hours; the blood is found to be highly florid in the veins, as well as in the arteries, and the heart continues to act strongly after the breathing has ceased.—*Broughton.* The animal lives as it were too fast, and death is occasioned by a general inflammatory fever."

THE LITERARY AND SCIENTIFIC REGISTER *for* 1842; *Combining in a Condensed Form a variety of Practical Information in Astronomy, Botany, Chemistry, Medicine, Meteorology, Zoology, and Science.* By J. W. G. GUTCH, M.R.C.S.L., &c. &c. &c. London: Suttaby and Co., Stationers' Court.

THIS is one of the most useful little works that has lately come under our notice; it is replete with information of the most varied character, and will be hailed as a boon by those whose heads are so occupied with matters connected with their daily business as to render it almost impossible for them to recollect what is contained in this pocket-book. We must confess that our memory has at times failed us, and we have then felt that there was a kind of vacuum which this work will in great measure fill up.

To give an account of the articles this work contains, would take up more space than we can spare: we must therefore content ourselves with stating the principal heads under which they are arranged. The first which meets our view on opening the book is "Astronomy," which is followed by "Botany." The next subject is "Chemistry," under which head is given the atomic weights of the simple substances, and a few hints on Electrotype Manipulation: this is succeeded by "Meteorology," to which the editor has alloted a good share of space. Under this head is given a meteorological journal, which we think likely to induce persons to note down the various changes in the weather which they would not otherwise do. Next comes "Medicine," in which is given a table "showing in what proportions opium and certain preparations of antimony, arsenic, and mercury, are contained in some compound medicines," which is likely to prove useful, the compounds formed of these substances being so numerous, that persons are likely to commit errors. The next head is "Miscellanea," under which we observe several very useful articles. In fact, the book is so crammed with matter, that it is almost impossible to give the reader any idea of its contents: we therefore most cordially recommend it, and wish it that reception at the hands of the public of which the industry of the editor has rendered it so deserving: no one should be without it, and the purchaser of it will find it the most useful pocket-book he ever possessed.

In conclusion, we would tell our readers that this book contains all the common information usually contained in a pocket-book.

THE OILY ACIDS; *Forming the first Supplement to the seventh edition of Dr. Turner's Chemistry.* By JUSTUS LIEBIG, M.D. Professor of Chemistry in the University of Giessen, and WILLIAM GREGORY, M.D., Professor of Chemistry, King's College, Aberdeen. London: TAYLOR AND WALTON, Upper Gower Street.

(SECOND NOTICE.)

IN our last, being unable to devote sufficient time and space to this valuable addition to organic chemistry, we promised some further remarks in our present number, a promise which we are now about to fulfil.

We are told in the preface to this supplement, that "the recent mention of an easy and accurate method of determining the amount of nitrogen in organic compounds (not yet published) has given a new impetus to the progress of discovery in animal che-

mistry." The absence of a process on which reliance could be placed, has long been a very great drawback to chemical sciences, and we hope that it will soon be published for the benefit of the scientific world.

Organic chemistry, under the auspices of many of our continental brethren, and several of our countrymen, has recently received numerous and valuable developments; but to none are we so deeply indebted as to Dr. Liebig.

We gave in our last number, Dr. Liebig's remarks on the action of metallic oxides on fixed oils and fats. We now give, as being intimately connected with the same subject, an extract which we should have given before, namely, the author's

"APPENDIX TO THE OILY ACIDS. NATURAL FIXED OILS AND FATS.

"The term fixed oil, or fat in general, signifies a compound of oxide of glycerule with certain organic acids. Such compounds are exclusively natural products, not having as yet been formed artificially.

"Among animals they occur chiefly in the cellular membrane; among plants in the seeds, capsules, or pulps surrounding the seeds; very seldom in the root. They all, when fluid or melted, make a greasy stain on paper, which is permanent. They are decomposed by acids, which combine with or destroy the oxide of glycerule; and by alkalies which unite with the acid, setting free the oxide of glycerule. The latter process is called saponification, because the compounds of the oily acids with alkalies have the properties of soap.

"The most abundant oils and fats are compounds of oxide of glycerule with stearic, margaric, and oleïc; two of these, and often all three, being present. Indeed, neither stearate, margarate, nor oleate of oxide of glycerule is yet known in a state of purity. From what has been said of these three compounds, which for brevity we shall call stearine, margarine, and oleïne, the consistence of the oil or fat depends on the predominance of one or other. Where the stearine predominates, the fat is firm and solid; if margarine be most abundant, it is soft like lard; while, if oleïne predominates, it is liquid. It is obvious that a mixture of stearine and oleïne in certain proportions will have the consistence of margarine.

"Fixed oils and fats are generally inodorous. Where they possess a peculiar smell, it is always owing to the presence of a compound of oxide of glycerule, with a volatile oily acid, such as butyric or hiric acid.

"Fats are more fusible than the acids they contain, but at low temperature they are harder. By pressure between warm plates, the greater part of the oleïne of fats may be separated. The remaining fat is harder, less fusible, and less greasy, in proportion as it approaches to pure stearine or margarine: in other cases they are definite compounds of stearine or margarine with oleïn; such is the case with the solid part of olive oil, and with the butter of theobroma cacao.

"Oils and fats may be divided into two well-marked classes, according to the action of atmospheric air, or of nitrous acid and nitrate of mercury, on them.

"The first of these classes contains the drying oils, so called, because, when exposed to the air, they absorb oxygen, and are converted into a transparent, tough, dry mass, or varnish. The drying oils, moreover, are not solidified by nitrous acid or nitrate of mercury.

"Of the nature and constitution of the drying oils, but little is known. They may be saponified by alkalies, but the acid of these soaps is different from the ordinary oleïc acid, and dries in the oils, like the oil from which it is obtained. They also contain oxide of glycerule. Many of the drying oils contain stearine or margarine, or both, dissolved.

"The second class, which may be called that of the fat oils, contains those oils and fats which do not dry on exposure to air, and which, when liquid at ordinary temperatures, or solidified by nitrous acid or nitrate of mercury.

"Owing to the impurities which oils and fats in their natural state contain, such as membrane, mucus, or albumen, and which act like the yeast in promoting chemical action, most of them, when kept, become rancid, as it is called. This change is produced by the absorption of oxygen in part, while the oily acids are set free, and sometimes, as in palm oil, oxide of glycerule is liberated. The rancid smell is owing to the production, at the expence of the elements of the oxide of glycerule, the impurities and the oxygen of the air, of a volatile body which appears to be acid, as alkalies remove it. Pure stearine, margarine, and oleïne do not become rancid."

This supplement contains, among many other highly important subjects, a most interesting chapter on the essential oils. The author divides these oils into three classes:—Non-oxygenated essential oils, oxygenated essential oils, and essential oils containing sulphur. We extract his introductory observations:

"OF THE VOLATILE OR ESSENTIAL OILS.

"Many vegetable products, when distilled with water, yield essential or volatile oils, which are liquids, more or less volatile, sparingly soluble in water, generally colorless, although occasionally having a peculiar tint, and for the most part possessing the entire odor of the plant. They are inflammable, burn with a bright but smoky flame, and un-

dergo peculiar changes by the action of air and water.

"Analgous to these are the so called empyreumatic oils, which are among the products of the destructive distillation of organic matter.

"Many of the essential oils exist already formed, and in the free state, in certain parts of plants; as, for example, in the rind of the orange and lemon, from which they may be obtained by mere pressure. Others flow from mere incisions in the plant, combined with resin, forming what are called balsams, as is the case with oil of turpentine. In several cases it has been proved, that the oils are first formed by the mutual action of two or more organic compounds when the plant is placed in contact with water; this is the case with the oil of bitter almonds, and with oil of mustard, and is true of all the volatile odoriferous oily matters formed during fermentation or putrefaction.

"It thus happens that perfectly inodorous plants, as, for example, *centaurium minus*, when allowed to ferment with water, and then distilled, yield a penetrating essential oil.

"The essential oil of *spiræa ulmaria* may be obtained, with all its characteristic properties, from salicine, by the use of oxidising agents; and finally, when starch or sawdust and similar substances are heated with sulphuric acid, peroxide of manganese, and water, they yield, besides formic and carbonic acids, oily liquids possessing all the characters of essential oils.

"In some fragrant flowers, as the lime blossom, jonquil and jassmine, the odorous principle may be extracted by ether or by fixed oil, but cannot be obtained by distillation with water; either because it is decomposed; or else is so soluble that it cannot be separated readily from water. In the latter case, it may sometimes be separated by saturating the water with common salt.

"Many essential oils contain a crystalline substance dissolved, to which the name stearoptine is given. This in numerous cases, as in the oils of lavender and valerian, is pure camphor. Others contain volatile oily acid mixed with a neutral oil, as is the case in oil of cloves; and many contain nitrogenized compounds, such as ammonia and hydrocyanic acid.

"Their specific gravity varies; some are heavier, others are lighter than water.

"Some contain no oxygen; while in others that element is present. It is worthy of especial notice, that all the non-oxygenated essential oils as yet accurately analysed contain carbon and hydrogen in the same relative proportions, expressed by empirical formula C 10 H 8. With widely different properties, they yield the same result, as to these elements, in 100 parts. There can be no doubt that in many cases the true formula is a multiple or submultiple of the above. In others, the arrangements of the same number of equivalents may vary.

"The oxygenated essential oils are commonly mixtures of several differing in volatility; but, as no one has succeeded as yet in effecting their complete separation in any case, the analyses of them which have been made are of no value.

"All essential oils are miscible with alcohol; and they are more soluble in weak spirits, the more oxygen they contain. To water, although sparingly dissolved by that liquid, they give their peculiar odor, forming what are called *distilled waters*. When these are made by distilling the plant with water, they are apt to mould, from the presence of matter; but, if distilled a second time, they keep well in closed vessels.

"It must here be observed, that the odor of these oils is closely related to their alteration by air and water. They almost all absorb oxygen, and those which do so most rapidly, have the strongest smell. If non-oxygenated oils be distilled with quick lime *in vacuo*, or in an atmosphere of carbonic acid, the product is absolutely inodorous; and it is impossible in this state to discriminate oil of lemons from oil of turpentine or of juniper: but, when exposed to the air, they quickly become odorous, while they absorb oxygen, becoming viscid and resinous. It would appear, therefore, as if the odor accompanied the act of oxidation, as is the case with metallic arsenic. By long exposure to the air, these oils gradually acquire the aspect of resins. Many become acid which before were neutral: the acid in oil of cinnamon is cinnamic, in oil of bitter almonds it is benzoic acid; and, according to Bizio, in some cases it is acetic acid. It is probable that the resins formed by the oxidation of essential oils are identical with those which in the balsams accompany the oils; but on this point we have no experiments. According to Saussure, carbonic acid is one of the products of the action of the atmosphere on essential oils.

"It is not probable that these oils act as radicals, combining with oxygen directly to form the resins; it seems more likely, that the oxygen removes one portion of their hydrogen, while the remainder of the hydrogen resists the action of oxygen, chlorine, and iodine much more strongly.

"All the non-oxygenated oils, in contact with iodine, yield a part of their hydrogen with a kind of explosion, while iodine replaces the hydrogen thus removed. The new compound, although rich in hydrogen, does not yield any more to an additional quantity of iodine. The action of both oxygen and chlorine is analogous: both remove a part of the hydrogen; both, also, enter into the new

compound, replacing that element; so that the new body, the resin, for example, always contains less hydrogen than the oil.

"By strong nitric acid the essential oils are converted into resinous matters, as yet little studied. Many oils burst into flame when mixed with nitric acid, especially if a little sulphuric acid be previously added to it. When boiled with moderately strong nitric acid till dissolution ensues, the oils yield peculiar crystallizable acids, but no oxalic acid. The essential oils dissolve sulphur and phosphorus, and are miscible with bisulphuret of carbon and hydrated acetic acid.

"We shall now briefly describe the individual oils, and their relations to other substances. The whole subject is but imperfectly known; and a profound and searching investigation is required not only of their composition, but also and chiefly of the changes they undergo by the action of oxygen, chlorine, iodine, &c. before we can hope to acquire a knowledge of their true nature and constitution. Oil of turpentine and oil of lemons, for example, are both composed according to the empirical formula C 10 H 8. The latter may be C 10 H 7 + H: the former C 10 U 15 + H. It is obvious that the decision of these and similar questions cannot be expected from mere analyses of the oils, however accurate."

All the analyses detailed in this work have been performed with extraordinary care, and the most implicit confidence may be placed in their accuracy.

No work of the present day comes near this: it stands alone: whether as an elementary work for the beginner, or as a book of reference for the proficient in chemistry, it is at present unequalled. We will conclude this notice by expressing our sincere hope that this work will have the effect, for which it is eminently calculated, of illumining much that is dark in science, and that the remaining supplement will not be long forthcoming.

II. CHEMICAL MANUFACTURES.

ON THE REPRODUCTION OF CHROMIC ACID FROM THE OXIDE OF CHROMIUM; AND FORMATION OF CHROMATE OF LIME.

BY CHARLES WATT, JUN.

In manufactures where large quantities of chromic acid are used, it has long been a great desideratum, in consequence of its high price, to discover some process by which the oxide of chromium may be re-oxygenised, and converted into chromic acid.

It is well known, that if oxide of chromium is fused with caustic potassa or soda, this object may be accomplished: but this process has one very great objection, viz. its expence, especially when the oxide of chromium is held in solution by acids, as is generally the case.

Another method was introduced by Mr. C. Watt, sen., about two years ago, in which the re-oxygenation of the oxide of chromium was effected by means of peroxide of lead; but as the oxide of chromium is generally held in solution, by either muriatic or sulphuric acid, and sometimes by both, this was found not to answer, in consequence of the formation of a large quantity of sulphate and chloride of lead: moreover, expense was an objection to the extended employment of the process, although not to such an extent as in the former one.

At that time, being in the habit of using large quantities of bichromate of potassa for bleaching palm oil, in the factory of Messrs. Hawes, I began some experiments on the subject, which terminated in the discovery of a process which, for nearly two years, I have worked with perfect success, and which has exceeded my most sanguine expectations. The difficulty in the outset was much increased by the presence of a great preponderance of both sulphuric and muriatic acids in the solution of oxide of chromium, but I have been enabled, by a careful management of the process, almost, if not entirely, to obviate this.

The article used to re-oxygenise the oxide of chromium in this process is so very cheap, and so easily obtained, that nothing can for a moment be argued against it on this score—an argument which is generally made use of, and I must say with much truth, against nine new chemical processes out of ten.*

The process is conducted in the following manner:—

The green oxide in solution is put into a wooden tub holding about 10 cwt., and some well slaked lime is added until the acid is saturated; it is requisite to add the lime gradually to prevent any of the oxide of chromium being precipitated during this part of the

* The reason of this is obvious: persons who live by the discoveries they make, or fancy they make, are so led away by their imagined success, that they never trouble themselves with manufacturers' calculations: if they did, they would not find themselves, and the parties to whom they offer their processes, so often deceived.

operation. The saturation of the superabundant acid being thus accomplished, if the solution contain sulphuric acid, the liquor is to be allowed to settle for an hour, and is then turned over into another wooden vessel, and finally slaked lime is added until all the oxide of chrome is precipitated, which will be shewn by the solution becoming of a milky aspect, and which may be satisfactorily ascertained by taking out a small portion, and allowing it to settle for a few moments, when, if the oxide of chromium is entirely precipitated, the supernatant liquor will be found to have entirely lost its color. I should here state that in this process it is of the greatest importance that the solution should be kept thoroughly stirred during the operation.

The oxide of chromium being now entirely precipitated, it is to be allowed to stand for a day or two to settle; the water is then to be taken off the top, and two or three pails of fresh water added, and the mass well stirred, A hole should be made in the bottom of the tub, which should be filled up with tow, so as to allow the water to drain off without permitting the oxide of chromium to pass out.

This substance, which is a mixture of oxide of chromium and lime, is then to be dried, and placed, about two inches in thickness, upon a furnace, the construction of which I shall explain further on, and turned about every half hour until the process is completed, which is shown by the substance having assumed a bright yellow color instead of the greyish one it previously possessed. During the whole of this part of the operation, care will be required not to employ too great a heat, as the product of this operation, which is, chromate of lime, is decomposed by heat, assuming a green color, and is thus rendered worthless.

The furnace which I have found to answer the purpose better than any other, is formed of a large flat wrought-iron plate, so set that the fire may play evenly on its under surface: it should be about six feet long, and three feet wide, and the fire-place about one foot long, and two feet wide. It will be as well to build a thin arch directly over where the fire plays, as if this is not done, the plate soon becomes burnt through in this part. The plate should be held down by a strong iron bar on each side, which will answer two purposes, viz., of preventing the plate from rising, which it would otherwise do in consequence of the heat, and of forming sides for preventing the mixture of oxide of chromium and lime from falling off. According to this arrangement, as the fire plays under the plate lengthways, the chimney will be at the opposite extremity to the fire door, and by bringing it back again, about two feet above the plate, may be made serviceable for drying the article previous to its being burnt, which will save much time and fuel.

The material is first to be placed on the chimney in a pan which should be made to fit it, and dried: this being done, it is to be removed to the lower plate, chopped up, and the process carried on as before described. It should not be turned oftener than is necessary, as, the powder being very light, much waste is sometimes thus occasioned.

This process gives rise to much speculation as to the source whence the oxygen is derived, by which the oxide of chromium is oxygenised. At first sight, it would appear most probable that the water contained in the hydrate of lime produced the effect by its decomposition; and this appears to be in some measure corroborated by the fact that dry lime and oxide of chrome have no action on each other: but on more mature consideration this does not appear to be the case; if it were so, a large quantity of hydrogen would be given off: and I have never been able to effect the oxygenation of the oxide of chromium when the air has been excluded: however, be this as it may, moisture and a free access of air are indispensably necessary; and although I have here mentioned these speculations, which naturally arise, they in no way affect the results, which are a perfect oxygenation of the oxide of chromium and formation of chromate of lime.

One thing certainly is strange in this process, *i. e.* the quantity of lime sufficient for the formation of chromate of lime falls down with the oxide of chromium during its precipitation, and, if the process is conducted with care, with but very slight preponderance: of course the product contains whatever impurities the lime originally contained.

Chromic acid may be obtained from the chromate of lime by sulphuric acid, and, if care be used, of much greater purity than from chromate of potassa or soda, in consequence of the insolubility of the sulphate of lime which is formed.

It will be as well to state (and this should be particularly observed when the oxide of chromium results from the use of chromic acid in bleaching palm-oil) that the presence of organic impurities must be carefully avoided, or the results will be far from satisfactory: my reason for alluding to palm-oil more particularly is because during the process some glycerine is generated, which, if not well washed from the oxide of chromium before it is burnt, will, as I before stated, render the operation unsatisfactory. Since the discovery of this process, I have tried to apply it to the formation of chromic acid from the chrome ore, but at present my endeavours have not been attended with success, which I consider to be owing to the lime being incapable of fluxing the ore.

In conclusion, I would add that if the above process be carefully conducted, it will be found perfectly satisfactory, and, if the heat of the furnace, which should not exceed a dull red, is equally maintained, it will burn three

batches a-day, and will require only a very moderate supply of fuel.

Knowing, as I do, that large quantities of chromic acid are used, and that the consumption is greatly on the increase, I hope that this process may prove worthy of the notice of parties who are in the habit of using that article.

MANUFACTURE AND REFINING OF BORAX.*

BY M. PAYEN.

Formerly, crude borax, produced by the evaporation of little saline lakes, was procured for use in the arts from India, China, Persia, the Island of Ceylon, Southern Tartary, Saxony, and Peru; sometimes, imperfectly purified in those places and sent out in small crystals, it came to Europe under the name of half refined borax.

The process of refining, long kept secret in Venice, afterwards confined to Holland, was imported into Paris by the MM. Lecuyer; it presented difficulties which were not well understood and overcome until lately. Until 1815, refined borax sold at from 7 to 8 francs the kilogramme: at that time the manufacture by means of the boracic acid of Tuscany and factitious soda, was commenced in France.† At the commencement of the refining of this borax, the small volume and the little solidity of the crystals formed a serious obstacle to its sale, gave rise to a belief in the influence of particular bodies on crystallisation, and caused such a prejudice in favour of Dutch borax, that it was necessary not only to imitate the brownish tint and the Dutch packages, but to bruise the angles of the crystals, in order to produce an appearance similar to that of the foreign salt. The latter could not sustain the competition, which very soon lowered it 0·50.

Then M. Cartier and I were enabled regularly to prepare borax in large solid crystals, in well determined conditions, and in apparatus which I shall describe, adding the most recently introduced improvements, in concert with M. Buran. I will also point out the long unknown cause of the remarkable variations of the rendering into borax for equal quantities of boracic acid and soda employed, either in manufactories or in the laboratory.

First Matters.—We have seen how the boracic acid of Tuscany gradually became more impure: the products imported into France now contain only from 0·74 to 0·83 of crystallised acid; the larger quantities of foreign matters seem to be owing to the fact that the acid of Monto-Rotondo, which is less impure, is kept in the country for the manufacture of borax at Livourne.

The 17 to 26 hundredths of foreign substances comprise, in the acids at present imported, water, sulphates of ammonia, magnesia, lime, and alumina; chloride of iron, muriate of ammonia, traces of hydrosulphuric acid, argil, sand, sulphur, a yellow coloring matter, and a nitrogenous organic substance soluble in alcohol: the sulphates and chlorides contained in boracic acid are the cause of great expense in soda to manufacturers; there results from them sulphate of soda and carbonates of magnesia and lime. The traces of alumina and oxide and iron form with the other insoluble substances a bulky deposit which cannot be completely removed, with economy, from the solution.

The cost in carbonate of soda, and the loss of soda in the deposits, the foreign salts and supernatant liquors, depreciate so much the more the boracic acid already overburdened with expense for the carriage of these foreign bodies.

To the means which we have pointed out of avoiding these inconveniences, by purifying it at the places where it is produced, we may add that desiccation at 100° C., removing half of the water contained in the humid acid, would raise from 0·56 to 0·72, the proportion of real acid sent out, and would diminish in the same ratio all the expenses of importation. By adding the economies pointed out in these simple improvements, the quantity of realisable acid sent out would be doubled under the same weight, or the expense of packing, carriage, insurance, duties, warehouse-room, &c., which amount to about 15 francs per 100 kilogrammes before it arrives in Paris.

For most of the purposes for which boracic acid is used, it is necessary to form it into borax; the formation and crystallisation of this salt present, besides, the most certain and economical means of eliminating foreign bodies. Finally, the form and characters of the crystals give to consumers every desirable guarantee.

PREPARATION OF CRUDE BORAX.

For treating 1000 kilogrammes of boracic acid, 1200 kilogrammes of crystallised carbonate of soda are employed, or an equivalent quantity of the dry carbonate or salt of soda of commerce, and about 2000 kilogrammes of water, minus the quantity which may be furnished by the supernatant liquors of a previous operation, or by the condensation of the steam used for heating it.

The carbonate of soda is first dissolved in a vat, lined with lead, and heated by means of steam from a boiler, and which may be introduced at will by turning a cock, into a pipe reaching almost to the bottom of the vat, where it joins a horizontal coiled pipe perforated with holes.

* *Annales de Chimie et de Physique*; July, 1841.

† See *The Chemist*, No. II., for an able paper, by Dr. Bowring, on the boracic acid lagoons of Tuscany.

When the carbonate is dissolved, and the temperature is raised to nearly 100° C., we begin to throw in, by 4 or 5 kilogrammes at a time, the powdered boracic acid. The arrangement of the covered vat allows the gases to be directed into a condenser, containing sulphuric acid, which might be useful to collect the ammonia disengaged in the state of carbonate, if the acid of Tuscany should continue to be imported as impure as it is at present.

At all events, it is useful to keep the vat covered, in order to prevent a great loss of heat; the acid should be added gradually, in order to prevent too great an effervescence at first, which would cause the liquid to run over: when all the acid is poured in, the solution should mark about 21° of Baumé's barometer, and the temperature should be raised to boiling, that is, about 105° C.

The steam is then stopped; the opening by which the carbonate and the acid were introduced is closed; it is then left to settle for 10 or 12 hours.

The liquid being sufficiently clear, it is drawn off, by means of a tap, into wooden crystallising vessels, lined with thick lead, whose depth does not exceed 50 centimetres.

When the crystallisation is finished, the supernatant liquors are drawn off into reservoirs.

The crystals, which are agglomerated in plates round the sides, are then detached by means of chisels and hammers; the crystalline plates are set to drain on an inclined plane, covered with lead, whose slope directs the supernatant liquors into a basin or gutter.

The supernatant liquors and the washings of the deposits of one operation serve to commence another saturation;* the crystalline plates constitute the crude borax, which requires refining.

The deposits formed in the vat are, after the decanting of the liquid, extracted by means of a large tap; they go into a reservoir, from which they are taken to be washed.

REFINING OF BORAX.

We have said that the principal difficulty of this operation was owing to the necessity of obtaining large and solid crystals: the volume depends on the mass of the solution, on the slowness, and especially on the regularity of the cooling; solidity can be obtained only by preventing the crystals from starting up by the action of the cold air, when the supernatant liquor is drawn off. These conditions are effected in the following manner:—

The solution is prepared in a vat, lined with lead, large enough to contain 9000 kilogr. of borax; the solution is effected with the aid of heat, by means of steam brought from the generator to the bottom of the vat by a leaden pipe.

The crude borax, and the small crystals of the preceding refinings are placed in an iron basket, suspended by means of a chain passing through a pulley: care is taken to immerge the basket a little below the level of the liquid, and as the liquid tends to precipitate by becoming more dense, currents are established, which facilitate and regulate solution, and avoid the troublesome operation of stirring the liquid.

To each metrical quintal of borax, about 8 kilogrammes of crystallised carbonate of soda are added, and the solution is brought to the density of 21° Baumé; the whole of the liquid is then run out into a wooden crystalliser, lined with thick lead, and covered with a lid likewise lined with lead.

These large crystallisers should be kept apart from one another, in order to prevent the blows necessary for removing the crystals from communicating a shock which would disturb the crystallisation. Some precautions should be adopted for rendering more gradual the lowering of the temperature. It is with this view that the sides are covered with a double envelope of joined plates, and that the space between the crystalliser and this double envelope, is filled with powdered charcoal, and, finally, that the upper part of the lid is covered with two or three layers of coarse woollen stuff.

The crystallisation is finished in twenty-five or thirty hours, according to the external temperature. It has been ascertained that it arrives at its last term when the thermometer does not mark more than from 25° to 30°. All the supernatant liquor is then run off, by means of a large syphon, the liquid retained at the bottom among the crystals is removed by means of a sponge; the lid is then let down, and the crystalline mass is left for five or ten hours, until it acquires an equilibrium of temperature with the surrounding bodies.

Then two men go into the crystalliser, and detach successively from top to bottom, with a hammer and chisel, the crystals at the sides: the whitest are found at the upper part, on all the vertical sides. Towards the bottom they are more voluminous, turbid and greyish: this tint does not displease consumers; however, the crystals at the bottom are set aside, in order to cleanse them from one another, and by screening them in a settled supernatant liquor.

All the crystals should likewise be separated by means of a small hatchet, on the table where the picking is carried on; they are afterwards turned into a basket, which eliminates all the small crystals, and which are redissolved and crystallised.

The picked crystals are packed in cases re-

* When the supernatant liquors contain too much sulphate of soda, chloride of sodium, organic matter, &c., they are evaporated to dryness after the borax has been allowed to crystallise at 33° C. then the sulphate of soda below crystallises that temperature.

sembling the Dutch ones, containing 60 kilog. nett.

The preparation of refined borax under the octohedral forms differs in the solution being charged until it marks 30° of Baumé's areometer for the temperature of 100° C; it then is put into the crystalliser: the octohedral borate commences to be formed when the temperature lowers to 79° C; it terminates at 56° C. It is then necessary to remove the supernatant liquor by means of a syphon, in order to avoid the prismatic borate being superposed on the former.

The operation is finished as in the former case, but the crystals remain bound together, since, far from being separated by the last shock, they remain combined in sonorous and very hard plates; it is therefore easy to obtain pieces of all dimensions. It is known that this borate differs from the first, because it contains five equivalents of water instead of ten, because it effloresces in damp air, and because its specific gravity is equal to 1·815 instead of 1·705.

The supernatant liquor, drawn from large vessels, allows to deposit an abundant crystallisation of prismatic borax, which, drained and dried, is applicable to all the purposes to which that salt is generally applied in solution or powder: however, its crystalline form not being so easily discernible as to present habitual guarantees in this branch of commerce, it is sent out so only to large consumers, and especially to the manufacturers of the fine china called opaque porcelain.

Octohedral borax is sold in plates whose faces do not present any appearance of facets nor of angles belonging to regular crystals; that is owing to an old prejudice of consumers, who designate octohedral borax by the name of fused borax, and think that they receive ordinary prismatic borax, when plates presenting on the face crystalline irregularities are sent to them. It is therefore customary to break with the hatchet all those edges, which, however, present the real criterion of the purity of this product.

It is conceived that the formation of a borate, containing 0·70 of dry salt instead of 0·47 which ordinary borax contains, must have occasioned mistakes relative to the renderings of the acid in manufacture on a large scale, and even in laboratory trials, when the circumstances and the nature of the formation of these two crystallisations were unknown.

PURIFICATION OF GUM SANDARACK AND MASTIC, FOR THE PURPOSE OF PREPARING COLORLESS SPIRIT-VARNISH.

BY T. W. NAYLOR.

Put two parts of gum sandarack, and one of mastic, into a suitable vessel: pour on them about four parts of spirit of wine; let them remain together for a few minutes, when, if on taking a piece of the gum out, it appears clear, transparent, and free from color, the liquid portion should be decanted off,* and the residual gums mixed with a sufficient quantity of alcohol, which must not, on any account, be weaker than 60°.

The varnish is greatly improved by the addition of about an ounce of Canada balsam to a pint of varnish.

Newcastle, Nov. 12, 1841.

* This liquid may be afterwards used in the formation of compound shell-lac and other varnishes, where a slight tinge of color is not an object of importance.—T. W. N.

III. PHARMACY, &c.

INUTILITY OF THE PHARMACEUTICAL SOCIETY TO COUNTRY DRUGGISTS.

To the Editors of the Chemist.

Gentlemen:—

When I wrote the observations which you have done me the honor to insert in your October Number, I did not expect that they would escape the notice of some members of the Pharmaceutical Society; indeed, had they done so, one of my chief objects would not have been answered, viz. that of learning from some of those who have the best means of knowing, what is the present state of that Society, and what are the objects to which it is giving its first and chief attention.

In the remarks which have fallen from the hand of your correspondent M. P. S. (I will drop the G. B., if you please, for sake of brevity and convenience, and not, I assure you, from any want of respect for those worthy initials), I am directed to "retrospect the actions of the society:"—I should be very happy to comply if I were in a position to do so; but unfortunately few of those actions have come to my knowledge; what I do know, is, that on the 15th of April last, at the second meeting of the members of the drug trade, held at the Crown and Anchor Tavern, the Pharmaceutical Society was constituted, and the committee formed. On the 1st of June a code of bye-laws was adopted, and from that time we may suppose the Society in working order. In July the Council published an ad-

dress to the Chemists and Druggists of Great Britain; and here I must end my retrospect, for I am not aware of any thing further that has been done.

In July the first number of the Pharmaceutical Transactions appeared—"instituted as an *experiment* for the purpose of illustrating the advantage of scientific discussion, and in the hope that similar meetings will shortly be appointed by the Pharmaceutical Society."—These meetings are private, and form no part of the Pharmaceutical Society, towards which M. P. S. has paid his subscription, and I believe it has never been announced to the subscribers where or when they are held.

Having complied with M. P. S.'s command, that I would retrospect the actions of the Society, I will go back to an observation of his. He says that the whole tenor of my letter is an attempt to prove that the present rate of subscriptions is too great, and that its objects are too extended. This is rather an extraordinary interpretation to put on my sentiments, and one which I reject. I do not think it just that a member living at a distance which precludes the possibility of his taking part in, or being present at the scientific discussions (that is, if the Society intend to adopt them) should have any part of his subscription expended upon them; such meetings should be supported by those who can avail themselves of their benefits. M. P. S. seems to think that we of the country can afford to provide more extensive opportunities of acquiring knowledge for our metropolitan brethren, without fear of suffering when placed in comparison with them, because they have not time to use the numerous advantages already at their disposal. He has quite settled the point, that the country druggists are the best chemists, to which of course I, as a country druggist, cannot object; and he says, perhaps the cause of this was unknown to me—I must confess it was. I have been engaged in both London and country business, yet I had not arrived at a knowledge of this fact before; and I must observe, that were I the proprietor of one of these hard-run London businesses he writes of, I would employ a sufficient number of assistants to have my business done with some regard to the comfort and mental cultivation of those about me.

I do not object that the sum of two guineas, or more, per annum, for the formation of a permanent school of chemistry and pharmacy is too much, but I do object to membership being purchased by yearly subscriptions. A designing person may pay his subscription for the first or second year, possess himself of the document shewing that he is qualified to write M. P. S. G. B. after his name, and for ever afterwards withhold his support.

I object that a Society cannot with propriety be termed "of Great Britain," unless all parts of Great Britain can equally share in its advantages, and I think it is not possible for those members whose business is at a distance from London, to join the conversational meetings, or make use of the library or laboratory.

M. P. S. tells me that "Fules and bairns should na see half dune wark." It is a matter of indifference to me in which of these two characters my brother druggist has been pleased to view the individual, whose puny efforts he considers to be aimed at the overthrow of the Institution. There was not much fear of my seeing "half dune wark," at the time in which I wrote my last, for as far as the country druggist is interested, it was not then begun, and although a second year's subscription is quickly becoming due, the only thing we have to rest upon is an announcement on the part of the Society, that "the council are endeavouring to meet with a house in a central part of the metropolis, with suitable accommodation, for the scientific and other business of the Society."

I am accused of treating with contempt the power of writing M. P. S. G. B. after the name of members. Now I am just anxious to keep it from contempt: M. P. S. says that members are admitted into the Society of Arts, the Botanical Society, and the Geological Society, by paying a sum of money. The truth is, that a person desirous of joining those societies must be proposed by a member; notice of his name, address, &c., must be hung up in the societies' rooms for a certain time; after which he is balloted for, and excluded if a certain number of black balls appear. Therefore we view the initials F.S.A., F.G.S., &c. more as a guarantee of the respectability of the member, and of his standing in society, than of the extent of his learning.

We are told by M. P. S. that we do not as yet know how many good branches may be given off from this parent stem: true; but at present we have only the seed. I wish to see it sown, germinate, become a perfect plant, firmly fixed, dispensing its benefits equally to those near, and those remote; and I do not think it would then lack willing hands to water it continually with the *Precious Element* sufficient to maintain it in full vigour.

I am, Gentlemen,
Respectfully, yours,
A Country Druggist.

REMARKS ON THE PHARMACEUTICAL SOCIETY.

To the Editors of The Chemist.

Gentlemen:—

Although some of the objections I feel to the constitution of the Pharmaceutical Society have been urged in your columns, yet I think it desirable that as many independent testimonies should be given as possible, in order that the Council may know the extent of that

widely spread feeling against which they combat.

It ought to be particularly understood, that it is the constitution of the Society that is objected to, and not its general objects. Every one must admit the importance of securing to the members of our trade an increased amount of intelligence and scientific attainments: but, whilst he desires this result, he may question the fitness of the peculiar measures proposed for the purpose. These two things are not quite so incompatible as some of your acute and learned correspondents seem to suppose.

The Pharmaceutical Society, in my opinion, can never seek to restrain any person from selling drugs who does not possess its diploma. Supposing it to be incorporated by royal charter, and to receive the support of the great body of the druggists throughout the country, any application for legislative powers to restrain such persons would recognise the justice of the claims made by medical men for protection against druggists, and, if carried out, would justify an act curtailing the privileges we already possess. Even if this were not the case, every druggist would be, as far as lay in his power, an occasion of rendering such a law ineffective, by endeavouring to sell every country shopkeeper drugs, &c., and from which he would derive a small profit.

Its benefits no doubt will be confined to an increase of public confidence in the trade, promoting the competency and scientific attainments of its members. But the question to be determined is, whether, upon the present constitution of the Society, it can become *generally* effective for this purpose.

No one at all observant of public opinion, can for a moment doubt that any honorary degree will be despised, unless accompanied by those attainments which fairly entitle its possessor to the distinction. Prejudice also is strongly excited against purchased distinctions, and this must operate against the first members of the Society. And without some alteration and extension of its privileges, this must continue to be the case with country members. To them, who most need, no advantages are offered. They are told that they must come to London to study. Are the projectors of the Pharmaceutical Society unaware that vast numbers of the young men who commence as druggists, never go to London at all; and, that of those who do go to London, few would be able to afford to devote their time and money, walking a Druggists' college. The only practicable improvement seems to have been despised by the council of the new Society. Had they made it a stipulation on the part of the Society that country members, where more than three lived in the same town, should hold periodical meetings, and send at certain periods papers of scientific or general interest to the Parent Society, they would have necessitated them to attempt self-improvement. These meetings in most towns would have given rise to the establishment of museums for their apprentices, and in many cases, lectures for the benefit of pupils would be given. Instead of this plan, they have chosen to ask for a subscription of 2*l.* 2*s.* per annum. The advantage they offer is, to send to the subscriber a monthly record of the great privileges enjoyed by his metropolitan brethren, and then leave him to furnish all the advantages he requires for self-improvement in addition. True, if the council of the new Society can secure their object, the benefit they will confer in making country druggists so benevolent as to prefer the improvement of others to their own, cannot be over-estimated.

The terms of subscription are much too high. Does the Pharmaceutical Society want 40,000*l.* a-year, to render it effective? Do its directors wish to render it general in its adoption? If they do, they ask for a subscription exceeding beyond all comparison that of any other medical body. But we wish to qualify for degrees, &c. Then let the recipients of the benefits pay for their advantages, as do those of all other incorporated bodies. They have now 600 or 700 in the kingdom enrolled as members, and are about to commence their undertakings. If 14,000*l.* or 15,000*l.* per annum is enough, why did they not fix the amount of their subscription at 5*s.* and have had twenty times the number of applicants for admission? In this way they would have been successful, and I will venture to predict that in their present plan they will fail;—that is, that the great body of the trade will not join except on equal terms.

I am, Gentlemen,
Respectfully yours,
JOHN SHAW.

Derby, Nov. 9, 1841.

A FEW REMARKS ON THE PHARMACEUTICAL SOCIETY.

To the Editors of the Chemist.

GENTLEMEN:—

I HAVE been aware of the existence of the Pharmaceutical Society for some time, but it was not until lately that I met with a small pamphlet on the subject, the perusal of the observations in which, fully stating the nature of that Society, and the objects it has in view, gained my concurrence, and hearty wishes for its success, with the exception of one point, and that is, as regards the subscription. Now it must be evident to every one, I think, that the London member will enjoy many advantages over the country one—such, for instance, as the mixing with the most enlightened of its members; hearing the various lectures contemplated; witnessing the practical working of the laboratory of the society; and being

always on the spot for acquiring early information connected therewith. These, I contend, are sufficient to excuse the country member from paying so high a subscription, because he cannot participate in the above privileges.

Taking these points into consideration, and considering also that the great bulk of the trade reside in the country, and that the demand is not merely to defray the expenses of forming the society, but that two guineas are to be subscribed annually, I am of opinion that the council would mete out justice to us, and get ample funds for all the purposes of the Society, were the subscription to be reduced to one guinea for the country members, and two for the town members.

Allow me to add in conclusion that I have, and probably so have other country druggists, been entirely overlooked by the council, not having had a circular sent me, or any communication whatever from them; yet I am resident only 10 miles from town; Pigott's Directory would therefore have supplied the name. If we are not worth soliciting, we are equally independent about the matter.

I am, Gentlemen,
Yours, respectfully,
A Country Druggist of 16 Years standing.

Nov. 15, 1841.

HINTS TO PRESCRIBERS OF SULPHATE OF QUININA.*

BY M. DONOVAN, ESQ.

The agreeable taste, odoriferous smell, and elegant colour of the acid infusion of roses have rendered it a favourable vehicle for the exhibition of more active medicines; and the choice is the more fortunate when the medicinal or physical properties of the infusion assist those of the remedy for which it is the selected medium. On these accounts the infusion of roses is frequently employed as a solvent for sulphate of quinina. The latter being nearly insoluble in water, and while in the insoluble state being much less active, it is rarely prescribed in liquids merely aqueous; sulphuric acid is therefore always employed to acidulate the water, as well as to add to the tonic powers of the salt. Infusion of roses contains the necessary quantity of sulphuric acid, and if it possess any medical efficacy, this coincides with the powers of the sulphate of quinina. Hence it is a common practice to prescribe infusion of roses with sulphate of quinina; and it is supposed that the two medicines form an elegant, efficacious, and compatible mixture.

I believe that the supposition is ill-founded. The mixture is not elegant; for it is no longer red and transparent, but becomes muddy and disagreeable in appearance;—it is not efficacious; for much of the quinina is withdrawn in an insoluble state;—and it is not compatible; for there are two sources of decomposition. Rose-leaves contain both gallic and tannic acids; hence gallate and tannate of quinina will be formed; both are insoluble in cold water; and they will remain floating through the liquid, notwithstanding the presence of sulphuric acid, which, so far as these salts are concerned, effects no good purpose, as it does not dissolve the new salts formed.

Sulphate of quinina is also prescribed in conjunction with compound infusion of orange-peel as a vehicle and adjuvant. I have seen this much practised both in England and Ireland, but believe the formula to be liable to the same objection, for a precipitate is copiously deposited.

It might be supposed that it is little matter in what state the quinina is administered, whether as sulphate, gallate, or tannate; but if the sulphate require the addition of sulphuric acid to hold it in solution, and if the state of solution be necessary to the exertion of its full medical efficacy, it must be improper to conjoin with it any agent which eliminates it in the solid form. Besides, it has never been proved that either the gallate or tannate of quinina possesses medical powers.

It seems much better to prescribe the sulphate of quinina simply dissolved in water, or in camphorated mixture, by the aid of a little sulphuric acid. If adjuvants are required, they may be administered by themselves, some time after the exhibition of the sulphate. It is unsafe to combine or modify such delicate articles, as it is difficult to foresee where injury may be done. Who, except one that had witnessed the effect, would suppose that there could be any impropriety of conjoining sulphate of quinina with preparations of cinchona bark? yet alcoholic solution of sulphate of quinina is copiously precipitated by tincture of bark, and insoluble tannate of quinina is soon separated. I have reason to believe that the precipitate which falls when the decoction of bark is allowed to cool, consists chiefly of tannate of quinina.

* *Dublin Medical Press, July*, 1841.

CASE OF COLICA PICTONUM, WITH BLUE DISCOLORATION OF THE GUMS.†

BY HENRY JOHNSON, M.D., SHREWSBURY.

Jan. 7, 1841.—I was desired to see William Benson, aged forty-nine, a plumber. He complained of constant aching pain at the epigastrium, which was very much aggravated at intervals. He had also pain in the knees,

† *Prov. Med. and Surg. Jour.*, 31st July, 1841, and *London and Edinburgh Journal of Medical Science*, Nov. 1841.

ankles, arms, and in the tendon of the pectoralis muscle. These pains were not increased by pressure or motion. The tongue was white and moist. Pulse soft, not quick. The bowels were confined, and the appetite was generally craving.

He stated, that about a fortnight ago he was in his usual state of health, and was at work in Wales laying down some lead pipes, in which occupation he was much exposed to cold, and thinks his present illness, which has only lasted about a week, was brought on by that exposure. His bowels are habitually inactive, three or four days passing without a motion. Has been a plumber several years. On looking into his mouth, I discovered the peculiar blue line on the gums, as described by Dr. H. Burton in the *Medico-Chirurgical Transactions*. See also *The London and Edinburgh Journal of Medical Science*, No. II. (Feb.) p. 128. The edge of the gum, where it is attached to the neck of the teeth, was fringed with a very distinct blue line, about one-twentieth of an inch in width, so that three or four of the molar teeth on each side in the upper jaw were thus half surrounded towards the roof of the mouth with a blue crescent.

Active purgatives were administered.

8*th*. All the pains better; almost none in the lower extremities; has had no sleep; epigastrium slightly tender; pulse 96, soft; thirst and retching; bowels freely moved; stools dark and scybalous. Repeat the purgatives.

9*th*. Has had some sleep; four stools; no scybalæ in the last, but dark and bilious; pains much abated; pulse 84; urine high-coloured and turbid; tongue very white and moist; some appetite.

R. Calomel, two grains.
Opium, one grain,
Antimonial powder, three grains.

A powder to be taken every sixth hour.

11*th*. Hardly any pain in the stomach; bowels regular; appetite improved, and sleep returning.

17*th*. Quite well. The blue line still visible, but more faint.

Remarks.—This is the only instance in which I have observed the phenomenon pointed out by Dr. Burton. He, however, has seen it in many cases, and suggests its presence as a valuable diagnostic sign in derangements of health, caused by the accidental introduction of lead into the system. Dr. Burton makes no attempt to explain how the coloured line here spoken of is produced. The following explanation has occurred to myself.—

It appears that lead, when taken into the system, has a peculiar tendency to affect the salivary organs, producing an increased flow of saliva. From this and other facts, it is probable that it enters the mass of the blood, and circulates therewith over the whole body. The salivary glands are stimulated to increased action by its presence, whilst another operation goes on in the gums. From the decomposition of particles of food, the decay of teeth, or the putrefaction of the tartar, it is probable that the mouth of almost every one contains at times a small portion of sulphuretted hydrogen. Even among those who clean their teeth, and therefore do what they can to remove the above sources of this gas, I have repeatedly found that a slip of paper impregnated with a solution of lead, in a few minutes gave a trace of this gas, by becoming slightly discoloured.

Now, it is easy to understand how the sulphuretted hydrogen, acting upon the lead within the vessels of the gums, precipitates the sulphuret of lead, which, remaining in the substance of the mucous membrane, imparts to them the peculiar blue tinge above-described; and this occurs only at the dental margin of the gums, partly, perhaps, on account of the thinness of the membrane at this point, and also on account of its proximity to the tartar of the teeth, one great source of the sulphuretted hydrogen.

PREPARATIONS OF UNGUENTUM HYDRARGYRI NITRATIS, AND OF SEDATIVE SOLUTION OF OPIUM.

To the Editors of The Chemist.

Southampton, Nov. 6, 1841.

Gentlemen:—

Through the medium of 'The Chemist,' allow me to introduce a new formula for preparing the Unguentum Hydrargyri Nitratis—not that I consider my process superior to that recommended by Mr. J. Harvey in your 18th No., but finding it objectionable on account of not being able at all times to procure the cocoa-nut oil, and that sometimes not genuine, which happened with me a short time since, and which led me to invent another process that may be found useful to some of your readers who value superior preparations:—

Take purified mercury .....1 oz.
nitric acid .....11 drachms.
spermaceti and white wax ā ā 3 drachms.
olive oil .....9½ oz.

First dissolve the mercury in the acid, then melt the wax and spermaceti in a pipkin, stir in two ounces of the oil, and keep it over the fire until it becomes clear. The remainder of the oil being poured into a mortar and rubbed together for a minute with the solution of mercury, quickly pour in the spermaceti and wax, keeping the whole briskly triturated with the pestle until it is cold.

The strength of the ointment prepared as above will be found exactly the same as that

ordered in the Pharmacopœia, retaining the same color and keeping one uniform consistence.

If not occupying too much space, I think the following will be found one of the best forms for preparing a sedative solution of opium: every process that has been given in various publications appears to me to have been nothing more than solutions of opium in acetic or citric acids, and consequently containing all the exciting principles of opium.

Take opium sliced three ounces, distilled water eight ounces, boil for a quarter of an hour in a covered vessel, and filter; repeat the process three times, by pouring fresh portions of water on the dregs, mix the filtered solutions, and evaporate to one pint; when cold add a solution of sesquicarbonate of ammonia till precipitation ceases, filter immediately (before the morphine crystallises), wash the precipitate with distilled water, mix it with the filtered liquids, and evaporate carefully to an extract; dissolve the extract in fourteen ounces of distilled water previously acidulated with one drachm of citric acid; lastly, filter and add two ounces of rectified spirit. After the solution has been made for a few weeks, a portion of coloring matter will deposit, which must be separated by filtration.

Tests.—Solution of sesquicarbonate of ammonia will produce no precipitation, if carefully prepared—nitric acid strikes an orange-red color.

The strength of this sedative solution is about double that of laudanum, but it can be prepared in a more concentrated state, by increasing the quantity of opium and citric acid to the same portion of the solvent of the extract.

Trusting that the foregoing will be found useful,

I remain, Gentlemen,
Your obedient Servant,
Henry Osborn.

ON THE PREPARATION OF VINUM FERRI.*

BY M. DONOVAN, ESQ.

The virtues of this preparation, the first metallic medicine on record, have been known to mankind since the time of the Argonautic expedition; its medicinal character has therefore stood the test of experience during 3100 years,—and it is now more in use than it has been for a long period. The will of the profession retains it, although it is expunged from the three British Pharmacopœias; and a medicine that hath withstood such vicissitudes cannot be destitute of virtue. Why, then, is it expunged? why is there so much difference of opinion? The answer is, because there are such differences in its strength, and in the modes of preparation.

I have, by a very simple process, removed all uncertainty from this preparation, and now obtain it always of the same strength, containing an effective quantity of iron, of an agreeable flavour, and still possessing all the aroma of the wine. The process is:—Take of the best hock one pint; common rust of iron of the shops, well levigated, two ounces. Introduce both into a matrass, which plunge into a water-bath maintained at the temperature of 100°. Constantly agitate the matrass for an hour; then remove it from the water, and the next day filter. The colour of this vinum ferri is a very deep greenish brown, almost black when the volume is great; its taste is ferruginous, agreeably and highly vinous; it produces a pleasant warmth in the stomach, and never sickens. In its effects it must be tonic, diuretic, emmenagogue, anthelmintic, and carminative. It does not, in a moderate dose, excite. No other wine than hock will afford a preparation possessing these virtues. The dose for an adult may be three or four drachms thrice a-day; in smaller doses it is of little use. If it is to be exhibited in combination with a bitter, it agrees well with colombo or gentian. By this method, in one day, we obtain a far better preparation than is procurable by the processes of the pharmacopœias in two months. The iron exists in it chiefly in the state of protoxide.

* *Dublin Medical Press, June* 23, 1841.

ON THE PREPARATION OF MEDICINAL WATERS WITH MAGNESIA.

(FROM A CORRESPONDENT.)

As few chemists, and still fewer apothecaries possess stills, the medicinal waters, such as aqua menthæ, anethi, &c., are in general prepared by triturating the essential oil with magnesiæ carbonas, adding rain-water and then filtering, which method is, I believe, recommended by several writers on pharmacy.

Having had constant experience in dispensing, I have frequently observed the inferiority of waters so prepared to those distilled; they are always weaker, and they soon spoil; but having lately made an observation which leads me still more strongly to object to such waters I am induced to lay it before your readers.

Having occasion to dissolve 3fs ferri iod. in ℥xij aquæ cinnamon. I perceived an immediate decomposition, and from the rich color recognised ferri sesquioxydum: on enquiring, I found that the water was prepared with magnesia, and I therefore concluded that the small quantity of magnesia in solution having passed through the filter, decomposed the ioduret of iron, forming ioduret of magnesia, and precipitated the ferri sesquioxydum, formerly called subcarbonate of iron.

Under these circumstances, I should recommend, where distilled waters cannot be procured, that a sufficient quantity of essential oil dissolved in spirit be added to previously filtered rain-water, which will not decompose those delicate chemical combinations, the use of which daily increases.

J. S.

Peterborough.

ON DIACETATE OF LEAD IN INTERNAL HEMORRHAGE.*

BY W. SWEETING, ESQ., ABBOTSBURY.

The use of this remedy has been long known, but as far as my observations extend, it has been administered in inefficient doses, and with combinations which appear to me objectionable, and made upon wrong principles.

Four or five years have elapsed since I first administered this medicine, in what I consider an effective dose. My practice is to give it in five-grain doses, every two, three, or four hours, according to the exigency of the case. The last case in which I employed the diacetate, was one of uterine hemorrhage, consequent upon abortion. The woman had miscarried the day before I saw her; she had lost a large quantity of blood, and the hemorrhage was still going on; she was pale, restless, sick, and the pulse scarcely perceptible at the wrist.

I immediately gave her five grains of the diacetate dissolved in distilled water, and repeated it every hour for twelve consecutive hours, and, upon an abatement of the hemorrhage, continued it every four hours for the next twenty-four. The woman recovered.

The diacetate should be rubbed up with a few drops of concentrated pyroligneous acid, in order to insure a complete solution of any carburate of lead, distilled water added, and the whole filtered through paper: with these precautions no ill effects need be feared.

A young gentleman labouring under typhus fever was attacked with diarrhœa, and discharge of blood from the bowels; the diacetate in the full dose was administered, and both hemorrhage and diarrhœa restrained after two doses. He recovered.

About two years since, I was called to a man in this village, labouring under a clearly-marked case of Asiatic cholera. He had been attacked at seven in the morning, but I was not sent for till noon, when I found him pale, pulseless, cold, and all but in that frightful state of collapse denominated the blue stage. I gave him five grains of the diacetate immediately; the draught was at once rejected. I then administered one grain every ten minutes, in a teaspoonful of acidulated water. After he had taken the medicine for the space of two hours, the spasms wholly left him, with every symptom of immediate danger, and the man speedily recovered.

Dr. Graves of Dublin has recommended the diacetate in cholera, in combination with opium, and at longer intervals than I employed it. It will be a satisfaction to me, that others whose situations furnish opportunities of making more extensive inquiries into the use of the diacetate, follow up the practice herein recommended.

* *Prov. Med. and Surg. Jour.*, 14th Aug. 1841.

REMEDIES AGAINST RELAPSE IN INTERMITTENT FEVER.†

In a case of intermittent fever, which yielded readily enough to the usual remedies, but always returned when these were given up, Dr. Kuntzmann of Berlin saw the disease effectually subdued by the exhibition of a table-spoonful of the powdered stem of the pumpkin, in half a table-spoonful of a tincture of wormwood. This dose was given every day at the same hour, and when indications of an approaching paroxysm were experienced. Dr. Osann says, that relapses of intermittent fever are best prevented by the use of the Tinct. Absinthii, which he has long been in the habit of prescribing, along with an equal quantity of the Tinct. Cinchon. Compos.

OFFICINAL IODIDE OF POTASSIUM.‡

As met with in the shops this salt is seldom pure; it mostly contains an admixture of iodate of potash. A solution of such a salt deposits a precipitate of iodine on the addition of nitric acid. Frequently it contains a large quantity of carbonate of potash. Perhaps the best mode of preparing iodide of potassium, is by the addition of carbonate of potash to a solution of iodide of iron at the boiling point, seizing the precise point of saturation nicely, and then evaporating.

PRESERVATION OF MEAT.

The new process for preserving meat by injecting salt into it by means of powerful pneumatic pressure, will shortly be put into operation at Buenos Ayres and other parts of South America, where it is well known that cattle

† *Hufeland's Journal, June*, 1841.

‡ *Wöhler, in Annalen der Chemie und Pharmacie, Juli*, 1841, and *London and Edinburgh Journal of Medical Science.*

are extensively slaughtered for the exportation of their hides, the carcasses being completely valueless. The meat thus prepared, will form an original article of export to this and other countries, and, should the speculation succeed, our provision market may be supplied with a new description of animal food, at a very cheap rate. So extensive are the herds of cattle and sheep, in the immense productive regions of the Pampas, that a traveller in South America a few years since, states, that the carcasses of sheep were used as fuel in heating furnaces.

EFFECT OF GAS LIGHT UPON THE HEALTH.

To the justice of the following remarks, which we take from a late lecture delivered by Dr. Epps, at the Mechanics' Institution, at Liverpool, there are few who will not be disposed to subscribe.—"And here let me notice one circumstance, in connexion with ventilation. It is this — *the immense consumption of pure air by the combustion of gas.* The quantity consumed by a single burner, is considerable; and when there are numerous burners, the consequent deterioration of the atmosphere must be very great. It may, therefore, be presumed, that those who are confined in establishments in which many gas-lamps are, hour after hour kept lighted, *must*, especially if free ventilation is not established, breathe a poisonous atmosphere, and thus have their bodily health injured. This is particularly the case in shops or warehouses, where *goods* abound: the impurities of the air are *absorbed by the goods*, and thus a new source of poison is created, operating upon the health, even when the gas burners are not lighted. There are evils connected with gas, which *indirectly* add to this deterioration: the cheapness of the light, the little trouble connected with it, the ease with which it is put on and put off, create a strong temptation to the trader to adopt late hours, which, by exhausting the constitution, render the persons exposed to the noxious air still more liable to the injuriousness of its influence. In fact, all *artificial light* is injurious, more or less. It is injurious, because the progress of combustion is itself a *deteriorator of the atmosphere*; and, therefore, day-light should be the time in which business should be, if possible, completed.

DEFICIENCIES IN DRACHM AND GRAIN WEIGHTS.

To the Editors of The Chemist.

GENTLEMEN:—

My attention has recently been called to the great inaccuracy which exists in many of the drachm and grain weights in general use. I have obtained sets from different houses, and in all, great discrepancies have been found. In one ½ drm. weight, as much as 6 *grains* was deficient, and proportionally great inaccuracies were observable in the grain weights. This certainly is a serious evil, and dispensing chemists should be cautioned in this respect. I should like to know where such as may be relied on are to be had.

I am, Gentlemen,
Your obedient Servant,
J. Y. B.

ON THE MILK SOLD IN PARIS.*

BY M. QUEVENNE.

THE bad quality of the milk sold in many dairies in Paris, is a fact which all the inhabitants of that capital are fully aware of. M. Quevenne, apothecary to La Charité, who has endeavoured to find out the cause of it, is of opinion, that it is owing rather to the mixture with other substances to which it is subjected in the hands of the milk-sellers, than to the food with which the cows are fed, or the byres in which they are lodged. The cows of Paris and its neighbourhood, on an average, give eleven litres of milk, daily, during the year. From each litre, thirty-four grammes of butter can generally be obtained, while from the milk of other countries, twenty-nine grammes of butter can only be procured. Thus the milk of Paris and its neighbourhood is richer in butter by one-eighth. The milk of Paris considered as aliment, is good and wholesome, but the confinement of the cows in their dark abodes, deprives it of that aromatic and savory taste possessed by the milk of those cows which feed in the open air; however, as long as it is pure and fresh, it forms an aliment of good quality. The influence exercised by the food of the cows over the milk, is confined entirely to the taste and to a slight change of colour. When they are fed upon peas and beans, it acquires the insipid and herbaceous odour of these vegetables and it coagulates more rapidly when the food is malt. In a word, the milk is so much the more agreeable to the taste, as the cows are fed in winter on beet-root, straw, hay, lazun datches and bran, which they always get in more or less quantity.

M. Quevenne having purchased numerous specimens of milk at different prices, and in different parts of Paris, has ascertained that the only difference the price makes in the milk, is to deprive it of cream, and dilute it with more or less water. However, at certain periods of the year, viz., during thunder storms and great heat, some milk-sellers, especially those at a little distance from Paris,

* *Annales d'Hygiéne et de Méd. Legale*, July 1841; *and London and Edinburgh Monthly Journal of Medical Science.*

add to each litre about two grammes and a half of the carbonate of soda. This salt has the power of neutralising for some time the acid properties of the milk, which cause it to coagulate. But this mixture does not falsify what we have already said, as it has no bad effect upon the health. Nothing else is ever added to the milk of Paris, but what we have just mentioned. There is no truth in the belief that adulterations are made with eggs, gum, sugar, flour, potatoes, or decoctions of bran, rice, or barley, as these substances for the most part, are all too expensive. The general price of milk is four sous the litre. Good milk cannot be had under six or eight, and the pure milk not deprived of its cream, sells at from ten to twelve sous the litre.

ON THE REMEDIAL MEASURES TO BE ADOPTED IN CASES OF ASPHYXIA FROM THE VAPOR OF CHARCOAL.*

BY GABRIEL PELLETAN.

HAVING had occasion to attend several persons attacked with asphyxia from the vapor of charcoal, I have proved that the most simple excitant is the passage into the nasal fossæ of a feather dipped in common vinegar.

It is the means which has always first caused the muscular contractions indicating revival.

DISCUSSION ON ARSENIC, IN THE ACADEMY OF MEDICINE.†

Paris, 15th August, 1841.

I REGRET exceedingly to begin this correspondence, intended to establish a closer and more prompt correspondence between the cultivators of medical science in this country, and in Great Britain;—it pains me, I say, to begin this correspondence with the arsenic question, which has now, for nearly two months, been discussed in the Academy of Medicine, with an acrimony, a rudeness of expression, and an intensity of personality, well calculated to grieve every impartial and right-feeling man. Your readers are, I presume, aware of the origin of this discussion. They know that Marsh's apparatus, and its use in investigating supposed cases of poisoning with arsenic, is ostensibly the subject of dispute; but they may perhaps not be aware of the secret origin which certain individuals have had chiefly in view, viz., to throw discredit on M. Orfila, as an authority in forensic medicine, and to lower him in the estimation of his professional brethren.

The point at which M. Orfila's researches may be said to begin, is the fact that arsenic absorbed by the organs, may be discovered by destroying the animal matter constituting these organs. When animal matter is destroyed by the action of nitric acid, or nitrate of potassa, the residue is placed in Marsh's apparatus, and arsenical stains collected on a porcelain capsule by the burning of arseniuretted hydrogen. This process, when announced, was speedily repeated by different experimenters. MM. Flandin and Danger, obtained spots which they said were identical with true arsenical stains, although not an atom of arsenic had been put in their apparatus. Moreover, they maintained that the carbonization of animal matter in close vessels, by the aid of sulphuric acid, was a process preferable to its carbonization by nitric acid, or nitrate of potash in open vessels. Though the Institute, and the Academy of Medicine are not agreed on this last point, they have satisfactorily settled the question as to the alleged identity of the true and false arsenical stains. The former are instantly dissolved by nitric acid, without the aid of heat. When the liquor is evaporated, and the residue treated with perfect neutral nitrate of silver, it gives a brick-red arseniate of silver; whereas, the false are sparingly dissolved by the same means, and the product, with the nitrate of silver, is a yellow deposit of phosphate of silver. For these reasons, that modification of Marsh's apparatus should be used, which has been made by the Institute. It consists of a flask with a curved tube, containing amianthus, which prevents the too violent effervescence of the liquid. At another part of this same tube, the arseniuretted hydrogen gas is decomposed by the aid of a spirit lamp, and a metallic ring obtained. The chemical reactions of arsenic ought to be verified on these rings as on the spots. By following this plan, mistakes are impossible.

To whom are we indebted for these discoveries, and to whom do we owe these valuable precepts? Is it to M. Orfila, or to his antagonists, MM. Flandin and Danger? It stands recorded in the Reports of the Academy, that long before these gentlemen had announced the possibility of having pseudo-arsenical stains, M. Orfila had stated the method of testing, to avoid fallacy from this source. So far back as 1839, he insisted upon the necessity of collecting the arsenic both on the capsules and in the tube. Justice to M. Orfila demands this statement, while, at the same time, it must be admitted that others deserve credit for perfecting the method of carbonizing the animal matters, and of fixing more attention on the pseudo-arsenical spots.

MM. Flandin and Danger deserve this meed of praise; and to them we are also

* *Journal de Chimie Medicale*, Aug. 1841.

† From the Paris correspondent of *The London and Edinburgh Journal of Medical Science*. No. ix, Sept. 1841.

indebted for the proof of the non-existence of arsenic normally in the bones. The establishing of this single point is sufficient to make their researches illustrious; but their friends in the Academy of Medicine have been ambitious to gain more glory for them. During five sederunts, with M. Gurdy at their head, they have fought with rage and bitterness to pervert the true meaning of the labours of M. Orfila, and to wound him by introducing into the debate useless and unmannerly personalities; and to a certain extent they have accomplished their unworthy object. The Academy, wearied, but not convinced, has fallen into the snare, and consented to modify the conclusions of the commissions. Still, however, these remain substantially the same, and the Academy, like the Institute, has rendered homage to the scientific labours of M. Orfila. The following are the conclusions which this learned body has at last adopted.

1. It sometimes happens, that from incomplete incineration or carbonization, non-arsenical stains are formed by Marsh's apparatus, which have the appearance of true. 2. It is impossible to mistake the pseudo-arsenical for the arsenical stains, if they are subjected to the action of chemical re-agents. 3. The processes for carbonization by sulphuric acid, and nitrate of potash are equally good; but sulphuric acid is the preferable substance to employ, when one wishes entirely to destroy fatty matters.

The apparatus of MM. Danger and Flandin is ingenious; but it is better to employ that of M. Orfila, which is substantially the same as that adopted by the Institute.

These conclusions were put to the vote, and carried amid much tumult and uproar. After the meeting broke up, groups in keen altercation were to be seen within the hall, and without in the quadrangle.

CASES OF SUFFOCATION AND POISONING.*

BY J. B. THOMSON, ESQ.

CASE I.—SUFFOCATION FROM A PEA IN THE WINDPIPE.

AUGUST 8th.—This evening I was summoned, without delay, to visit a fine child, of two years and a half of age, apparently dying of suffocation: the eyes were fixed and staring; the countenance livid, and expressive of great anxiety; the inspirations difficult and noisy; the expirations short and forcible. The child occasionally attempted to cry and cough ineffectually, or with a hoarse croupy sound. There was a sound in the windpipe like that of a valve opening and shutting, which sound seemed to arise from a foreign body striking at intervals against the region of the rima glottidis. Slight convulsive motions affected the whole body. On looking into the throat I saw a number of peas lying at the back of the fauces, and pushed them into the gullet; still the alarming symptoms remained, and it seemed evident that a pea or some foreign substance had found its way into the larynx, or was probably entangled in the chink of the glottis. I ran home for a scalpel, and when I returned the child seemed in *articulo mortis*, so that the friends thought it needless to do any thing. I proceeded, however, to open the trachea, and the moment the scalpel entered, the child was relieved. In a few seconds expiration and inspiration went on freely. Considerable venous hæmorrhage took place. Still there was no appearance of a foreign body. I introduced a bent probe through the external opening upwards to the glottis, and felt a hard round substance, which I tried to push upwards into the throat. Convulsive coughing took place, and, on withdrawing the probe, breathing went on by the mouth and nose, and every symptom of danger disappeared. Soon after this a neighbouring medical practitioner whom I had sent for arrived, and in a consultation with him it was resolved that, although there was no certainty of the foreign body being removed, yet all symptoms of danger were absent, and no further operation was warranted. Leeches and antimonials were had recourse to, and any inflammatory results were slight and easily obviated. The child got well; the wound healed; and my patient even ran about the house and out of doors with his wonted liveliness. The only suspicious symptom remaining was cough for about a fortnight after the accident. I had ceased attendance, and my fears were beginning to be forgotten, when on the 26th of August, eighteen days after the first alarm, I was asked to visit the child. He was feverish, had a bad cough, with mucous râle; appetite impaired; flesh soft and flabby. The mucous râle and painful cough increased my suspicions that a foreign body was still lurking about the bronchi. The child had antimonials and a purgative.

Next morning an express called me to see the child. I found all the former alarming symptoms of suffocation had suddenly returned, and the mischievous body was evidently floating loosely in the trachea, and striking, at every cough, against the rima. Although the child's pulse was low, and there was not the same hope of the operation being ultimately favourable, I insisted on again opening the trachea. The friends refused to submit, on the ground that the child was just dying, and there was no room for hope. Convulsions carried off the child within two hours from

* From *The Medical Gazette* of Oct. 22, 1841.

this attack. No post-mortem inspection could be procured.

Remarks.—It appears quite certain, from the history of this case, that a foreign substance (probably a hard pea) had found a lodgement about the upper part of the windpipe, threatening suffocation; and on the trachea being opened, the admittance of air through the opening revived the sufferer. At the same time the pea left the upper part of the windpipe, and occupied a situation in the bronchi, which had no perceptible influence upon the respiratory process. It is well known that a foreign body may so remain for a long time in some part of the breathing apparatus, and be coughed up through the rima months afterwards; but my case shows that a very different result may take place—all may seem favourable, and sudden suffocation ensue. I own I have had some *compunctious visitings* since this case terminated fatally, and deeply regret that I did not insist strenuously upon keeping the opening in the trachea patent by the introduction of a tube; and were such a case again presenting itself, I should certainly try to benefit by my melancholy experience in the present instance.

CASE II.—POISONING BY SULPHURIC ACID.

On June 6th, at 11 o'clock P.M., I was called in great haste to visit an infant of about a year old. The mother had thought it necessary to give her child a little castor oil for a slight cold it had caught. The castor oil stood in a closet beside the concentrated sulphuric acid, and both articles were contained in the clear bottles commonly used for Ol. Ricini. A tea-spoonful of the castor oil was first given in a little milk with sugar; and part of this mixture being lost in the administration, it was resolved to give a little more. Half a tea-spoonful of sulphuric acid was then given by mistake instead of the castor oil. This latter dose was poured into a tea-spoon containing a little sugar and milk, with some remains of the first dose adhering to the spoon, and in this way administered to the infant. The mistake was immediately discovered from the little victim's painful cries and restlessness, and confirmed by coloured figures in the nurse's gown being discharged by some of the liquid being rejected. Not more than twenty-five minutes elapsed before I saw the child, which was two miles distant from my house. I found the little sufferer crying incessantly with a rough croupy voice. It was restless, agonized with pain, and had occasional vomiting of a tough glairy mucus. The messenger who was dispatched for me having mentioned what had occurred, I had provided myself with magnesia, which was instantly, along with milk, poured into the child in large quantities. Castor oil was also administered freely. The pulse was rising rapidly, and was very small and thready. In order to anticipate the worst, leeches and a blister to the throat were applied without delay, but without any obvious relief. Demulcents of a mucilaginous kind were occasionally given and swallowed. When I left the house of my patient, at 2 A.M., the child seemed to sleep, but there was increased roughness in the respiration; mucous râle; pulse rapid and small; bowels freely opened.

Next morning, at 9 A.M.—All the symptoms aggravated; heavy respiration; mucous râle; pulse 140, and thready. A consultation was now proposed by myself with my able and experienced friend, Mr. Syme, of Alloa. We saw the child together about noon, and pronounced the case hopeless. No change in the treatment was deemed necessary. In the afternoon, about 4 P.M. patches of disorganized membrane were coughed up by the child. It died about 11 o'clock P.M., exactly twenty-four hours after the sulphuric acid was administered.

No necrotomic inspection was allowed.

OINTMENT FOR THE ITCH.*

BY DR. DE LA HARPE.

The following is the composition of the ointment employed and recommended by Dr. De La Harpe:—

Flowers of Sulphur.....	16 parts.
Sulphate of Zinc.....	2 ,,
Powder of White Hellebore ..	4 ,,
Soft Soap	31 ,,
Lard	62 ,,

He used it in upwards of 400 cases. The mean duration of treatment was, in 1836, eighteen days; in 1837, fifteen; in 1838, eleven; and in 1839, ten.

POISONING BY TOBACCO GIVEN IN ENEMA.—MISTAKE OF THE APOTHECARY ATTRIBUTED TO THE FRENCH DECIMAL SYSTEM OF WEIGHTS AND MEASURES.†

BY M. TAVIGNAT.

M. Tavignat, an *interne* of hospitals, has recently published in the *Gazette Médicale*, a case which in more respects than one is full of interest. A man of fifty-five years of age, of strong constitution, entered the hospital to be treated for enlarged prostrate. On examining him with attention, small worms were found to exist in the rectum. To destroy them, a tobacco enema was prescribed. From excess of precaution, the dose ordered in the visit-book was only sixty centigrammes in two hundred grammes of water. The prescription

* *Gazette Méd. de Paris*, July 1840.

† *Journal de Médecine et de Chirurgie Pratiques, January* 1841, *and London and Edinburgh Monthly Journal of Medical Science.*

was in all respects correctly made out, but in place of sixty centigrammes, sixty grammes were given. Seven or eight minutes had hardly elapsed after the administration of the clyster, when symptoms of poisoning manifested themselves, whereupon M. Tavignat, the *interne de garde*, was immediately sent for. He immediately ordered a purgative enema, and a stimulant potion. Sinapisms were applied to the extremities, and cold applications to the head. The patient was also bled from the arm, and the whole body subjected to frictions. He did not rally, however, but remaining in a state of profound stupor, was seized with general trembling. The respiration became more and more anxious, and he died comatose without having vomited.

Remarks.—We have said that the case of Tavignat is interesting for more reasons than one, but for the present we will only advert to one of its practical applications. It discloses a lamentable error committed in a Parisian hospital, where it is well known that the system by which drugs are dispensed, is well organized. Are we to attribute this blunder to the ignorance of the apothecary whose duty it was to make up the prescription? Assuredly not, for the most ignorant pupil is familiar with the decimal divisions, and knows thoroughly the value of the gramme and the centigramme, but as we have stated on a former occasion, it is to the decimal system itself that we must attribute the fatal mistake. Constant attention is ever requisite not to confound the gramme with its compounds; for the words decagrammes, decigrammes, centigrammes, constantly in turn present themselves to the pen of the prescriber, and the mind of the apothecary. Such blunders as that now narrated, be it remarked, do not occur in quarters where the advocates of the new system can allege the existence of ignorance. To-day the accident takes place in the pharmacy of a Parisian hospital, and some time ago the journals recorded that a professor of a private school of medicine was the cause of a similar misfortune.

ADULTERATION OF BREAD.

To the Editors of the Chemist.

Gentlemen:—

As you have repeatedly exposed in the pages of *The Chemist*, the fraudulent adulterations which are practised in articles of food, as well as in drugs, I expected to have found in your last number some notice of the convictions which have lately taken place in Staffordshire and Cheshire, for mixing gypsum with flour. This shameful sophistication of the prime necessary of life, has been carried on by a few parties on a large scale, and would, no doubt, have become more general, but for the prompt and vigorous measures adopted by the local authorities for its detection and suppression. As it is not improbable that similar adulterations are or may be practised in other quarters, where attention has not been awakened to the subject, it is very desirable to keep it before the eyes of the public; and I am sure that your pages will be cheerfully devoted to this object.

I have myself examined bread which contained about sixteen per cent. of gypsum; and a sample of flour which contained eight per cent. of the same adulteration!

The most effectual mode of putting a stop to these iniquitous proceedings is to arouse the vigilance of the public, and to furnish them with a simple method of detecting the fraud. The usual plan, and that which I have employed is, to incinerate suspected flour or bread in an open shallow vessel, keeping it at a red-heat, till the carbon is entirely burned away. The residue (with the exception of the very minute quantity of ashes left by genuine flour, and the salt used in making bread) may be considered as adulteration, and its nature determined by the usual tests. If the calcination be conducted in a covered crucible, the sulphate is converted into a sulphuret, and a solution of which throws down a dark precipitate from a solution of acetate of lead.

The process by incineration is a tedious one; but perhaps the best that has yet been proposed. By suggesting a more simple and ready test, adapted for general use, you would confer a benefit on the community.

I am, Gentlemen,
Your obedient Servant,
Q.

ON THE VALUE OF THE MICROSCOPIC EXAMINATION OF MILK IN THE CHOICE OF NURSES.*

BY M. DEVERGIE.

The author gives the results of several hundred observations which he had opportunities of making at the Nurses' Office (*bureau des nourrices*). He examined the milk of nurses with the microscope, like M. Donné, and he arrived at the following conclusions:—

The nutritive quality of milk is in direct relation with the quantity and quality of the globules. Under this point of view, the milk examined by M. Devergie presented three varieties, or rather three degrees. The milk with large globules was ordinarily met with in women of a sanguino-nervous constitution; however, it was sometimes also found in lean women; so that the best milk, that is to say, the most nourishing, is not always in direct relation with the constitution of the mother;

* *Royal Academy of Medicine, Paris*, Sitting of September 28, 1841. From the *Journal de Chimie Medicale*, November, 1841.

hence is explained the fact that thin, lean women may be excellent nurses. However. when milk is in large globules in one woman, and in small globules in another, it may be concluded that the former is a better nurse than the latter, for the goodness of the nurse should be reckoned by the degree of assimilation of which her milk is susceptible in the infant.

Now, it cannot be said *à priori*, that an infant is better nourished, and thrives more, with milk containing small globules, than with that containing large ones. It is therefore for experimental observations to decide whether the milk of such and such a nurse is good or bad for the infant; but when observation shall have taught, by example, that the milk does not nourish the infant, supposing that there is no apparent disease which may account for anhæmia (*anhémie*), micrography may then be resorted to, to prove the quality of the milk. If the latter, for example, were milk with small globules, another with large globules should be chosen, and *vice versâ*. M. Devergie has remarked that milk is sometimes of different qualities in each breast of the same woman: but it is more commonly so in those who are in the habit of giving the child one breast more frequently than the other.

Age has no influence on the qualities of the milk, nor has the constitution; observation having shown the author that milk with large globules is met with in women of twenty, as well as in those of thirty-five. Nevertheless, the author is far from giving to these microscopic remarks entire confidence in the selection of a nurse. He thinks, on the contrary, we must keep to the ordinary method and to the data which all accoucheurs are acquainted with; which does not prevent microscopic observation being made at the same time. M. Devergie has also proved several alterations in milk: these alterations relate to the color and the state of the globules. The globules have been found in a state of agglomeration, and the natural color altered to a blue or a green. This latter condition has appeared to accompany certain diseases of the child.

FORMULA FOR BAUDRY'S BALSAMIC PECTORAL PASTE.*

R.	Gum arabic	3 kilogram.
	White sugar	2 ,,
	"Thridace" (ext. of lettuce)	8gr.8decig.
	Sugar in pieces . . .	31 ,,
	Balsam of Tolu . . .	40 ,,
	Orange flower water .	186 ,,
	Essence of citron . . .	4 drops.
	White of four eggs.	

40 grammes of extract of liquorice prepared with stick liquorice, by maceration without heat, and afterwards brought to the proper consistence in a sand-bath.

The matters, being apportioned as above, are prepared as follows:—

The gum arabic is dissolved in double its weight of water, and passed through a sieve: then left to settle for six hours, in order that the smallest portions of sand may be deposited at the bottom of the vessel, then decanted into a well-tinned pan; the sugar, broken in pieces, must now be added, and heated in the sand-bath, stirring continually with a wooden spatula. When the paste is half made, the extract of liquorice and the "*thridace*" are added, and immediately dissolved.

The balsam of tolu is triturated in a mortar, with 31 grammes of sugar in pieces; this powder is put into a small matrass, with the orange flower-water, and the whole is heated in a sand-bath for six hours. At the end of that time, the liquor is filtered and added to the paste.

When, on beating the paste with the back of the hand, it is found to adhere to it but very little, the white of egg is added, in small quantities, stirring all the time, after having been well beaten up, and flavoured with the essence of citron. When all the white of egg is added, the paste is left on the fire for a quarter of an hour, stirring all the while; this paste is then poured into plates or iron moulds, which are exposed to a gentle heat for about a day: they are then removed, left to cool, and the paste is finished.

* *Journal de Chimie Medicale*, August, 1841.

HEMLOCK PLASTER.†

BY M. LEPAGE.

Since the commencement of last summer, I have repeated and compared the different processes which have been proposed for the last twenty years, for the preparation of hemlock plaster; and I must here declare, that none is preferable to that of the Pharmacopœia (French). However, as this process is complained of, and with good reason, on account of its causing a great loss of product, especially when a small quantity of matter is operated on, I propose the adoption of the following process, in which the proportion of hemlock to the mass of other matters is but very little changed from that in the Pharmacopœia:—

White pitch (*poix blanche*) . .	1 kilogramme.
Resin pitch (*poix resine*) . .	400 grammes.
Yellow wax	500 ,,
Oil of hemlock	250 ,,
Fresh hemlock leaves reduced to a pulp	2 kilogrammes
Gum ammoniac	500 grammes.

† *Journal de Chimie Medicale*, Oct. 1841.

When all the water of vegetation of the plant is dissipated, submit the matter, while warm, to the action of a strong press, and add the gum ammoniac and the ordinary matter.

The advantages of this pressure are, in my opinion :—

1st. That of giving a plaster not quite so dry as that of the Pharmacopœia, which is rather too much so;

2nd. That of causing less loss of product.

AGGLUTINATIVE PLASTER.*

BY HERR SCHAEUFFELE.

Herr S. describes a fine sample of agglutinative plaster, a perfect substitute for gummed diachylon, and even superior to it in brilliancy, in suppleness, and in its property of adhering strongly, without producing irritation. He gives the following formula for it :—

R. Resin.....	200	grammes.
Colophane.....	200	,,
Gum ammon.....	10	,,
Gum Galban.....	10	,,
Gum Sagap.....	10	,,
Turpentine.....	60	,,
Simple plaster ..	60	,,
Yellow wax	200	,,

The proportion of turpentine varies according to the season, between 50 and 60 grammes.

The cloth must be of the finest quality; it should be cut in strips of 250 centimetres in length, and 20 or 22 in breadth: it is calendered, each time two strips being placed one on the other. It is on the surfaces which have not received the contact of the cylinder, that the plaster is laid on by means of a knife, in four or six layers, according to the thickness required.

The plaster must be prepared at a gentle heat, giving sufficient time for the gum-resins to dissolve in the turpentine, the colophane and the resin, before adding the simple plaster and the yellow wax.

FORMULA FOR CHOCOLATE OF ICELAND MOSS.†

BY M. TAPIE.

The best means of employing the lichen for combining it with cocoa and sugar, consists in depriving it of its bitterness, at least in some degree, by immersion for a few minutes in boiling water. This done, the water is thrown away, the lichen is left to drain for some hours, then a decoction is made in half an hour: it is strained and evaporated, and the concentration is completed in the sand-bath. When the consistence is nearly like that of an ordinary extract, the matter is poured into plates or capsules, in order to effect a complete desiccation by means of the heat of a stove; this extract is afterwards reduced to a fine powder, which is distributed into the chocolate.

R. Loaf sugar.....	3	kilogr.
Cocoa (caraca in preference)	3	,,
Cinnamon of Ceylon	31	gram.
Extract of dry lichen	403	,,
Jelly of Iceland moss	500	,,

FORMULA FOR THE BALSAMIC PECTORAL PASTE OF REGNAULT.‡

M. Flon, apothecary at Paris, sent to the Royal Academy of Medicine, at its sitting of the 7th of May, the following officinal formula for the above paste :—

Four flowers.....	500	gram.
Gum arabic.....	3000	,,
Tincture of balsam of tolu ..	24	,,
Water	1500	,,

This paste is prepared with the above substances, according to the prescribed rules for the preparation of pastes.

POMMADE OF IODIDE OF SULPHUR.§

This pommade, administered by M. Nanche in phthysis pulmonalis, is prepared according to the following formula :—

Iodide of sulphur	2	decigrammes.
Lard.....	30	grammes.

Incorporate the iodide with the lard.

This pommade is to be rubbed on the legs.

M. Nanche also gives iodide of sulphur internally in the dose of 5 or 6 milligrammes *per diem*.

VERMIFUGE DRAUGHT.§

M. Levacher gives the following formula for the preparation of a draught which he has employed against tænia :—

Castor oil.....	60	grams.
Essence of turpentine.....	16	,,
Distilled mint-water	64	,,
Syrup	32	,,
Powdered gum arabic	8	,,

A mucilage is made in a mortar with the gum, the syrup, the oil, and the essence, afterwards gradually adding the mint-water.

* *Journal de Chimie Medicale*, Nov. 1841.

† *Ibid.* August, 1841.

‡ *Journal de Chimie Medicale*, August, 1841.

§ *Ibid.* November, 1841.

GARGLE OF SULPHATE OF ALUMINA EMPLOYED IN DEAFNESS.*

A young man, aged eighteen, who, for five months, had been troubled with very considerable hardness of hearing, which gave him much uneasiness, consulted Dr. Payan. Blisters on the nape of the neck, and on the arms, and other modes of treatment were ineffectual. The surgeon of the hospital of Aix having examined his throat, found the mucous membrane at the inferior part of the pharynx and the pillars of the velum palati redder and more swollen than in the healthy state; the tonsils were also much larger than they should be: he thought, and with reason, that the Eustachian tube might likewise be swelled and thus obstruct the passage from the pharynx to the ear; he then recommended the use of a gargle prepared with—

Sulphate of alumina . .	4 grammes.
Honey of roses . . .	26 grammes.
Water	225 grammes.

The patient used the gargle four or five times a-day. The guttural phlegmasia was soon modified. At the expiration of a fortnight, 2 grammes of sulphate of alumina were added to the gargle. After six weeks' perseverance in this treatment, the pharyngitis had ceased, the throat had assumed its natural color, and no traces of deafness remained.

BOOKS RECEIVED.

Elements of Chemistry, Including the Most Recent Discoveries and Applications of the Science to Medicine and Pharmacy, and to the Arts. Illustrated by Wood Cuts. By Robert Kane, M.D., M.R.I.A., &c., &c., &c. Dublin: Hodges and Smith. Longman & Co. London; Machlachlan and Stewart, Edinburgh. 1841. pp. 1204.

[This work unfortunately did not reach us until the present No. was made up: it will be reviewed in our next.]

The London and Edinburgh Monthly Journal of Medical Science. Edited by John Rose Cormack, M.D., Edin. London: H. Baillière, 219, Regent Street. Edinburgh: Maclachlan, Stewart, & Co. No. XI. (In Exchange.)

An Investigation of the Proposed Scheme of Medical Reform, in reference to Chemists and Druggists. Comprising an Analysis of Mr. Hawes' late Medical Profession Bill; A Review of the Pharmaceutical Society; and a Defence of the Druggists' "Counter Practice." Addressed to Benjamin Hawes, Esq. M. P., and the Chemists and Druggists of the United Kingdom. By G. Crook, M.P.S. London: R. Hastings, 13, Carey Street, Lincoln's Inn Fields.

[This pamphlet was also too late: we shall notice it fully in our next. In the mean time, we may observe, that it deserves an attentive perusal.]

TO CORRESPONDENTS.

J. T. Leith.—*Bromure* is the French word for Bromide. Bromide of iodine is formed by the direct action of bromine and iodine on each other

Mr. R. H. Kemp, Brighton.—The examination was stated to have been at University College; therefore our correspondent's question was uncalled for.

The suggestion of our correspondent at Hastings shall be borne in mind.

A. J. We do not know.

R. F.—The oxides of gold and silver may be procured at Knight and Son's, Foster-lane, Cheapside: the former is 5*s.* and the latter 3*s.* per bottle.

The China clay may be obtained at the same house.

T. G.—A correspondent and constant reader writes to us—"Anxious to see your useful journal rendered a safe work of reference in matters therein treated, I beg to suggest the occurrence (p. 339) of an error in the assignment of the Rosewood-tree to the genus *Aspalathus*. The best authorities make it belong to the *Jacaranda ovalifolia*."

Communications received from H. E.; A Constant Reader; J.W. B.; R.H.; W.M.; An Apprentice; J. H.; S. B.; A Norfolk Druggist.

Nota Bene.—*All Communications and Books for Review must be addressed, "To the Editors of The Chemist, care of Mr. Hastings, Publisher, 13, Carey-street, Lincoln's Inn Fields, London." Communications must be pre-paid, and sent before the 15th of each month; Books for Review, before the 10th.*

* *Journal de Chimie Medicale*, November, 1841.

The Title, Introduction, and Index for Vol. II. are included in this Number. The Volume may be had of the Publisher, in boards, price 7s.

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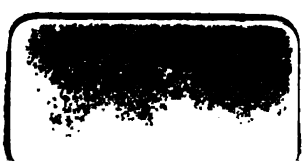
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